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Bell Telephone MAGAZINE

Moving Ahead on Two All-Important Jobs • LEROY A. WILSON

Television Strides Ahead in Seven-League Boots
HARRY H. CARTER

Looking Ahead with the Bell System

Merry Christmas in the Toll Offices • CYRIL K. COLLINS

You Can Tell by the Teller • ARTHUR F. LEET

Purchasing by the Western Electric Company • GEORGE DEMARE

San Francisco's Chinatown "Goes Dial" • WHEELER F. SCHALL

The Winter's Toll Was Heavy from Texas to the Dakotas
JUDSON S. BRADLEY

American Telephone & Telegraph Company · New York

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A Medium of Suggestion & a Record of Progress

Published for the supervisory forces of the Bell System by the Information Department of American Telephone and Telegraph Co., *195 Broadway, New York 7, N. Y.*
Leroy A. Wilson, *President;* Carroll O. Bickelhaupt, *Sec.;* Donald R. Belcher, *Treas.*

Who's Who & What's What

in This Issue

Leroy A. Wilson

THE SECOND OF PRESIDENT LEROY A. WILSON'S notable statements to stockholders at the A. T. & T. annual meeting heads this issue, his first having appeared here just a year ago, not long after his election to the Company presidency on February 18, 1948. That election climaxed a Bell System career which had begun 26 years before with the Indiana Bell Telephone Company when, two days after graduation from Rose Polytechnic Institute in Terre Haute, in June of 1922, he reported for work as a traffic clerk and student in Indianapolis. During his years with that company he had direct charge of the telephone operating forces in several districts throughout the state before returning to Indianapolis as district traffic superintendent in 1927.

Mr. Wilson transferred in 1929 to the Department of Operation and Engineering of the A. T. & T. Company in New York. His first work there was in the Traffic division, but he also gained experience in dial equipment engineering and in related fields. Ten years after his arrival in New York, he moved from the Traffic to the Commercial division of O. & E., where he was placed in charge of the work on telephone directories. The following year he was made rate engineer in the same di-

Harry H. Carter

Cyril K. Collins

Arthur F. Leet

George deMare

Wheeler F. Schall

Judson S. Bradley

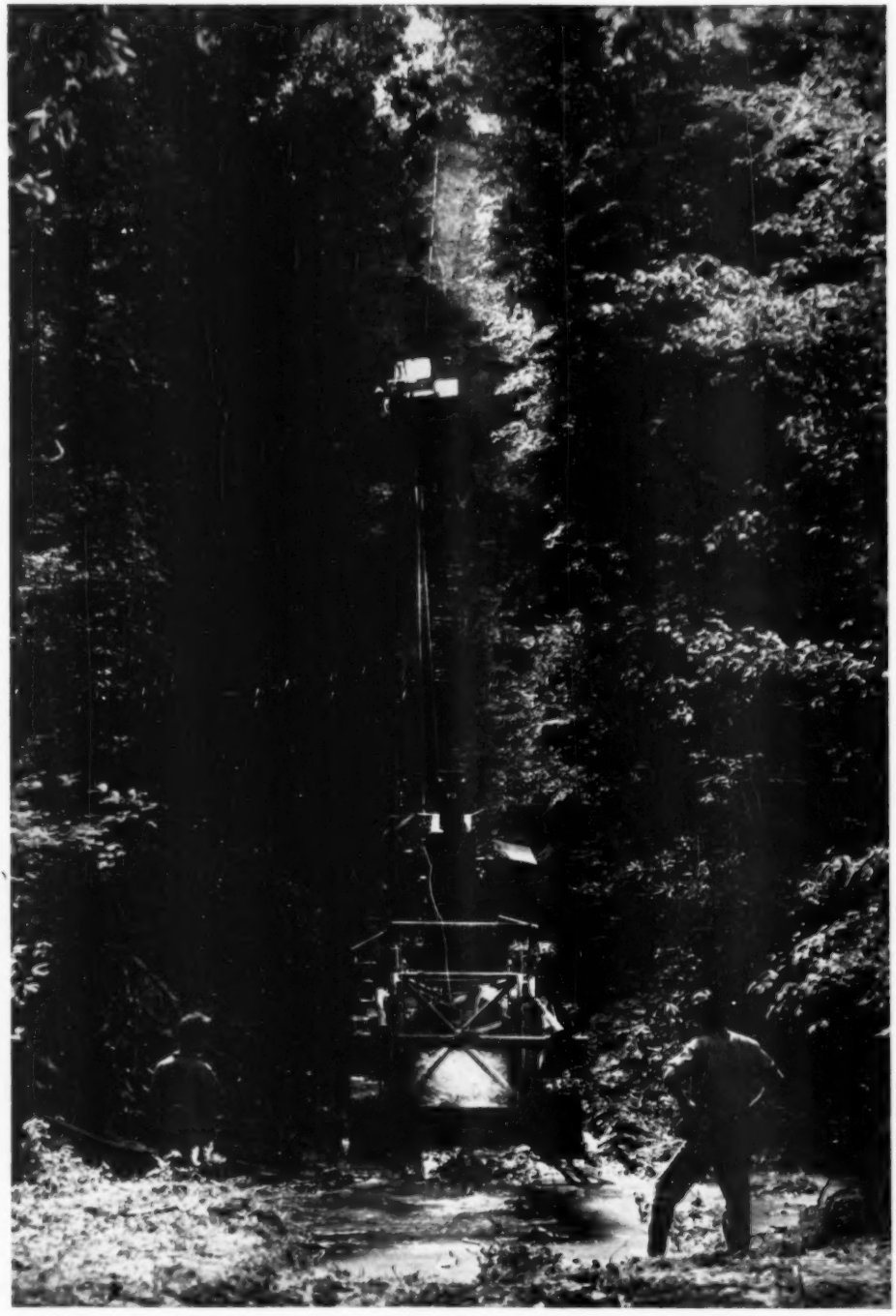
vision, and in 1942 he was appointed to head the entire Commercial division.

It was from this post that Mr. Wilson was promoted to an A. T. & T. vice presidency in 1944, with the assignment to study the revenue requirements of the Bell System; and it was during this period that he contributed "Reasonable Earnings to Insure the Best Service" to the MAGAZINE for Autumn 1945.

"BEHIND TODAY'S NEWS are long yesterdays . . . that have brought television to its present stage . . ." notes HARRY H. CARTER at the beginning of his article. He knows a good deal about those yesterdays, because his term as General Commercial Manager of A. T. & T.'s Long Lines Department covers a period of 22 years. That is less than half of his Bell System career, which began in 1903 with the New England Telephone and Telegraph Company in Belfast, Maine. He had gained experience in both Plant and Traffic work by 1910, when he was transferred to the Commercial Department; and had been successively Division Commercial Superintendent, General Sales Manager, and Metropolitan Division Manager of the New England Company before his transfer in 1927 to become head of the Long Lines Commercial Department in New York.

FEW toll traffic men are popular with their own families at Christmas, because they spend so much of that festive day where the twinkling lights are on the switchboards instead of on Christmas trees. That is a requirement of the job which they accept not too unwillingly, however, because they know their presence in the traffic rooms may help other people's Christmas telephone calls go through more quickly. As chairman of the special Bell System committee to study the Christmas service problem, CYRIL K. COLLINS spent a good part of last Christmas Day at the Long Lines Department in New York, and discusses the problem with that—among other matters—freshly in mind. Joining the Bell System in 1924, Mr. Collins had 16 years of Traffic Department experience with the New York Telephone Company and the New Jersey Bell Telephone Company, becoming successively District Traffic Superintendent, Toll Results Supervisor, and Traffic Methods Supervisor. In January of 1941 he was transferred to the Traffic division of the Department of Operation and Engineering in the A. T. and T. Company, where he headed the group concerned with force adjustment, peg counts, and expense analyses. Two years later he was

(*Continued on page 56*)



A cable plow train negotiates a steep hill on the Harrisburg–Pittsburgh section of the Philadelphia–Cleveland coaxial cable link joining the Bell System's Eastern and Mid-Western television networks. *See the article beginning on page 9*

In His Statement at the Annual Meeting of Stockholders Of A. T. & T., the Company's President Points Out the Major Problems and How They Are Being Met

Moving Ahead on Two All-Important Jobs

Leroy A. Wilson

DURING this post-war period, the Bell System has been moving at full speed and with utmost energy to accomplish two all-important jobs.

The first was to provide service to all who were waiting for telephones at the war's end—to meet the enormous new post-war demand—and to get the quality of service back to the high pre-war level.

The great efforts we have made have brought outstanding results, though we fully realize that there is still more to be done. We have installed over 10,000,000 new telephones since the end of the war. While there is still a waiting list, those who are waiting have for the most part applied for service in recent months. We are filling the great majority of all new applications promptly and are continuing our efforts to get on a basis where we can serve every new customer without delay. Over-all service quality, as was pointed out in the Annual Report mailed to stockholders in February, is rapidly being restored to pre-war excellence, and today I am glad to be able to add that in some respects the service is better than ever.

Our second continuing and essential post-war job has been to bring about a proper repricing of telephone service, to meet the steep climb in operating costs and to insure the financial good health of the Bell System in the face of the general inflation of our national economy. Here too we have made much progress—and also have much more to do. I should like to review this phase of our efforts briefly with you at this time, and think you may be interested first in some of the facts about our increases in costs.

TO ATTRACT and keep in the business the kind and number of people needed to meet our post-war service

obligations to the public, wages have been greatly increased. Further upward adjustments in wages made in the latter part of 1948 and early this year have increased expenses by more than $100,000,000 annually. The total effect of the three rounds of wage increases in the Bell System Companies since the end of the war has been to increase expenses of the System by over $380,000,000 a year.

In addition to wages, the System in 1948 expended approximately $175,000,000 for sickness, accident, and death benefits to employees or their dependents; for disability pensions; for payments into Pension Trust Funds; and for Social Security old-age benefit purposes. The Bell System has been a pioneer in this field since 1913, when our Benefit Plan was established, and is in the forefront of industry generally with respect to pensions and other employee benefits.

HIGHER WAGES to the much larger number of employees needed to care for the increased volume of business are not the only reason for the higher over-all cost of operations today. The System has been obligated to expand to meet the heaviest new demand for service in history, at a time when the prices of practically all materials, as well as the cost of labor, have risen sharply. The increase in revenues from the greatly increased volume of business does not offset the increase in expenses. On the contrary, while revenues have about doubled since the last pre-war year, expenses are now two and a half times what they were.

Telephone companies are different from most other businesses with respect to the expansion of their services. The average business can decide for itself whether to expand, and when, and how much. We, however, render a public service, and in each community where we operate every person who wants telephone service depends on us. He cannot get what he wants from someone else. It is our obligation, therefore, as well as our wish, to do everything we reasonably can to meet the public's needs. That is our job, and the Bell System is proud of its accomplishment since the war in handling the unprecedented demand for service.

ALTHOUGH expansion has already been tremendous, still more is required to meet the continuing demand. So far, as I have said, the System has added some 10,000,000 telephones, including 1,100,000 rural telephones, which we are continuing to install at the fastest pace in history. We have also greatly increased long distance facilities. In order to do all this, the System has increased its capital from slightly more than four billion dollars at the end of the war, when we were serving some 22,000,000 telephones, to nearly seven billion dollars today, when there are 32,000,000 telephones in service. While the number of telephones has gone up somewhat less than one half, the capital required by the System has gone up nearly 75 percent. The average new telephone requires much more capital than did the old, reflecting the higher costs of materials and labor in the post-war years.

Prices for telephone service are subject to public regulation. In most industries, companies change prices

themselves, in accordance with changing conditions of supply and demand, fluctuations in operating costs, competitive factors, and so on. In the telephone business, however, when price increases become necessary we must apply to the proper regulatory authorities for permission to put them into effect. In most instances, the hearings which are held have been rather lengthy. As a result, almost without exception, rate increases to date have been authorized well after the time when they became needed. It is of the greatest importance to the future of telephone service that the moderate increases in rates which are necessary be granted by the regulatory authorities as promptly as possible.

Since 1946, when the first requests for higher rates were made by the Bell System Companies, increases totalling $218,000,000 annually have been authorized or made effective. You will note that this is a great deal less than the increase in expense of over $380,000,000 a year resulting from post-war wage increases alone. The Companies have applications pending for additional increases in rates amounting to about $230,000,000 annually, and other applications will be made. This is necessary because we must not only meet the increased costs of labor and materials and the depreciation charges on the higher investment, but must also pay to investors a reasonable return on the almost doubled amount of capital needed to provide service.

Public regulation of the telephone business and public utilities was very properly initiated many years ago to insure that the companies would give good service and

President Leroy A. Wilson discusses a point with a stockholder at the close of the annual meeting. In the background is Carroll O. Bickelhaupt, Vice President and Secretary

that their rates and earnings would not be unreasonable. It was clear that the companies should not be permitted to take advantage of the users of the service. It was also clear that guarding against overpricing and excessive earnings was not the only responsibility resting on those who regulate public service companies. They likewise have the responsibility to see that the companies do not lose their ability, through loss of credit or for any other reason, to provide the service the public wants; and along with this they have a responsibility to see that the savings which people invest in the companies, in order that the public may be served, are fully safeguarded.

Over the years, regulatory bodies have recognized that earnings must

be adequate to attract and protect the savings of investors, and it is imperative in the interest of good telephone service that they continue to do so. In this post-war period, while increases in Bell System telephone rates have varied for different classes of service in different places, the amount of increases already granted, plus the total amount for which applications are now pending, comes to less than 20 percent of revenues. Additional applications for increases will be necessary in the future; but, assuming no further rise in costs, we are hopeful that these can be held to a minimum, and that in the long run the over-all increase in telephone rates in this post-war period will amount on the average to only a penny or so per call.

This is of course far less than the increases generally in the cost of living since pre-war years. It is far less than the rise in telephone wage rates, which have more than doubled. It is far less, too, than the increase in the cost of raw materials widely used in telephone equipment; copper and lead, for example, have about doubled and tripled in price, respectively. Comparing such increases in costs with the over-all increase in telephone rates granted and asked for, it is evident that a great deal has been accomplished through telephone science and the improvement of operating methods, to the advantage of employees, customers, and stockholders.

Further evidences of progress are to be found in the new and improved services which are even now foreshadowing the telephone art of tomorrow. The plans of past years are being transformed into the realities of today—more dial service, faster and more accurate handling of long distance calls dialed straight through to the distant telephone by the operator, more service to automobiles and other vehicles, more rural telephone service, television transmission over coaxial cables and radio relay, direct dialing by telephone users of more out-of-town calls over short distances, and so on.

THIS OUTLOOK again brings out the great value of keeping the Bell System in a prosperous condition to move ahead. A Bell System ready and able to invest largely in the betterment of essential services is important to the prosperity of the nation. An active construction program on sound and useful projects, and an accompanying high level of telephone employment, are in themselves desirable. Most important of all, they lead to the creation of facilities and services which the country can use to its increasing economic advantage.

We are sure that, given the increases in rates which are a "must" to assure future progress, the Bell System will be able to provide more valuable service to the millions of telephone users and greater opportunity for the employees who serve them. We shall continue every effort to accomplish the moderate and fair repricing that the good of the service requires; and we shall do this with full confidence that wise regulation, in the future as in the past, will permit earnings that will provide a steady and fair return to all who invest their savings in this business.

Bell System Facilities Link Cities from the Atlantic to The Mississippi in a Network for the Transmission of Video Programs by Cable and Radio

Television Strides Ahead In Seven-League Boots

Harry H. Carter

A NEW COMMUNCATIONS WORLD is coming into being. In the present state of television, nothing is static; today's achievement is tomorrow's commonplace. A fascinating vitality, a headlong progress, is the distinguishing feature of this latest field to engage the energies and resources of the Bell System.

Television has occupied so many headlines in the past year that it would be easy to assume all these advances just happened, and quite recently at that. But, as those wise in the ways of scientific and commercial development know, such is not the case. Behind today's news are long yesterdays of effort on the part of the individuals and organizations that have brought television to its present stage and labor to push it forward into a finer tomorrow.

The Bell System's connection with television comes about in a manner almost classic in the history of the telephone company's relationship with a new field of communication. Television is communication, of course. And communication is the business of the Bell System. Q. E. D.

Since the birth of the telephone some seventy-five years ago, each new service has been an outgrowth of its predecessor. Local telephoning . . . long distance . . . then radiotelephony to cities beyond the sea. . . . Lately we have extended telephoning to mobile vehicles, trains, and planes. For more than a quarter of a century a giant network of specal telephone wires has sped programs between radio stations. Recently, new values have been introduced into our networks—this time their ability to carry television programs both locally and from city to city. Striding forward in the fresh field of video, the Bell System nonetheless remains within its familiar basic field: communication.

President Leroy A. Wilson of the A. T. and T. Company was televised last January 11 during the program on the occasion of the linking of the Bell System's two major television networks

Early this year, when we joined our Eastern and Midwestern television networks, programs could then flash from the Atlantic to the Mississippi. An area where one-fourth of the nation lives had been brought within range of the Bell System's inter-city channels. In the opinion of the industry, this was a tremendous milestone, and a portent of larger television networks in the future.

At the première marking the occasion, many a telephone man fell to thinking back over the years to the research and commercial development which preceded this important event. On April 7, 1927, to begin with, the Bell Telephone Laboratories first demonstrated city-to-city television transmission by both wire and radio. From Washington by wire circuit, and from Whippany, N. J., by radio facilities, television pictures of Herbert Hoover, then Secretary of Commerce, and of an entertainment program were seen in the Laboratories headquarters in New York by Walter S. Gifford, then President of the A. T. & T. Company, and a group of scientists and journalists.

Although television transmission remained in the laboratory stage until the present decade, additional achievements were announced periodically—some so specialized as to be significant only to scientists, but others whose importance was evident even to the average interested person. Examples of these developments appear in the box on page 12.

As those listings indicate, the late 1930s hinted strongly that the era of commercial usage was not far off. Today's television networks grew from a 94½-mile coaxial cable installed in the Fall of 1936 between New York and Philadelphia. In the next few years, many important advances in inter-city television transmission were first worked out over this cable. However, during World War II, Bell System television development was halted and the coaxial

cable was returned to general telephone communication service.

Herbert Hoover, then Secretary of Commerce, appeared in Washington during the first public demonstration of television given by the Bell Telephone Laboratories on April 7, 1927. His face was clearly seen in New York

Out of the Laboratory

WITH THE WAR OVER, the television industry expanded rapidly and our activities were resumed. Since then, each year has been marked by an accelerated program as the Bell System has made intensive efforts to solve the difficult problems involved in placing an extensive network service at the disposal of television broadcasters.

Step One in this latest phase took place on February 12, 1946, when network television transmission between Washington and New York was inaugurated over Bell System coaxial cable facilities on an experimental basis, such service permitting trial use by the broadcasters without charge. Services at the Lincoln Memorial were televised and transmitted to broadcasting stations in New York of the National Broadcasting Company, the Allen B. DuMont Laboratories, and the Columbia Broadcasting System.

As the months passed, our service was increasingly used—particularly for programs originating in New York and transmitted to Philadelphia and Washington—and in October, 1946, Baltimore was joined to this network.

So far, coaxial cable had been the type of carrier relied upon for such television transmission, but now the Bell System added a second string to its bow: radio relay. Using this system, which beams the signal through the air from tower to tower, Bell System engineers extended the New York-Washington network to Boston in November, 1947. A few months later, Richmond was connected to the network by means of a coaxial cable channel from Washington. And so the situation remained until May 1, 1948, when free experimental service was discontinued and Bell System television network transmission was placed on a commercial basis.

Charges for inter-city television

Some Bell System Highlights in Television Research and Network Development

April 7, 1927 Inter-city television transmission first demonstrated to the public by the Bell Telephone Laboratories. From Washington by wire circuit and from Whippany, N. J., by radio facilities, television pictures of Herbert Hoover, then Secretary of Commerce, and of an entertainment program were seen in the Laboratories in New York by Walter S. Gifford, then president of the A. T. and T. Company, and a group of journalists and scientists.

April 16, 1927 Both image and sound (video and audio) were sent on the same frequency band by a single radio transmitter from Whippany to the Bell Laboratories in New York.

May 23, 1929 Original Espenschied-Affel patent application for coaxial cable was filed. The application specified the cable was to be used as a wide band (wide frequency range) long distance transmitting medium—both for telephone and for television transmission.

June 27, 1929 Color television first demonstrated at the Bell Telephone Laboratories in New York.

April 9, 1930 Two-way television in connection with telephone demonstrated publicly between the A. T. and T. Company Headquarters building and the Bell Telephone Laboratories in New York. Persons in booths at the two ends of the two-mile "line" were able to both see and talk with each other. The demonstration for public and press was continued for more than a year.

October 5, 1936 First coaxial cable installed between New York and Philadelphia, available for tests for multichannel telephone use.

November 9, 1937 Television transmitted over coaxial cable from New York to Philadelphia. The television image contained only 240 lines, as opposed to the 525-line image of today.

May 21, 1940 Television images of 441 lines and using a frequency band of about 2,700,000 cycles transmitted over coaxial cable from New York to Philadelphia and back to New York, a distance of nearly 200 miles. This demonstration was repeated before audiences of scientists and engineers twice within a year.

June 24, 1940 Republican National Convention televised in Philadelphia, and transmitted to the National Broadcasting Company's studio in New York for local television broadcasts.

May 21, 1941 Television images transmitted 800 miles by connecting the ends of coaxial tubes in a cable between Stevens Point, Wis., and Minneapolis, so that the images were sent uninterruptedly back and forth in the cable.

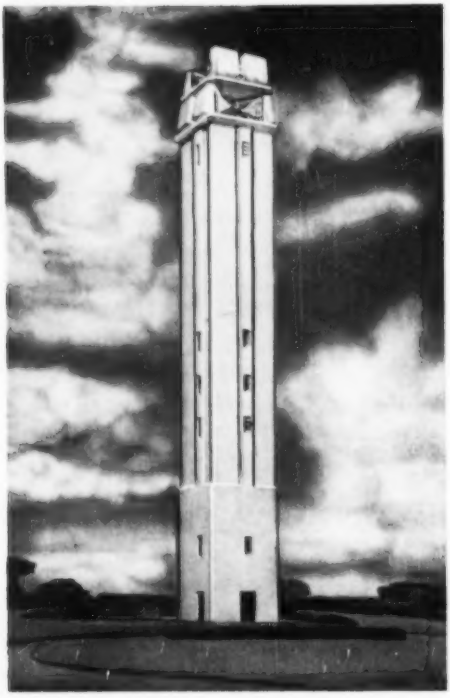
service follow somewhat the same scheme as do those for radio broadcasting network service. The rates for either monthly or occasional service are based on the air-line mileage of the inter-city and local channels involved, plus charges for station connections. In addition, the rates for the audio channels needed in connection with television are those usual for such service.

The Big Night

THUS FAR, our channels had paralleled the Atlantic, but on September 20 of last year a new region was brought within the scope of inter-city television service as the Bell System linked together seven major Midwestern cities: Buffalo, Cleveland, Toledo, Detroit, Milwaukee, Chicago and St. Louis. Finally came television's biggest night to date: January 11, 1949. Then it was we connected our two networks, and Americans in fourteen metropolitan centers were given an opportunity to view the same program simultaneously as it traveled over a Bell System network extending 2,100 miles.

The Bell System and the four great television broadcasting systems jointly presented a 90-minute program to signalize what Leroy A. Wilson, President of the A. T. & T. Company, described as a "fine ex-

The final splice is made in the coaxial cable between Pittsburgh and Cleveland which united the Eastern and Mid-Western television networks



A radio relay station of the type now being built to transmit telephone calls and television programs

ample of effective teamwork" between Bell System people and those in the television industry. This program, broadcast by more than thirty stations, featured notables speaking from New York, Washington, and Chicago; a new Long Lines Department film, "Stepping Along With Television"; and entertainment provided by the four networks. On this occasion Mr. Wilson tied the Bell System's work in television to its basic responsibility, telephony, by saying "The development of better long distance service has resulted in facilities which can carry television programs, and therefore enable us to help serve the public in this field."

From Washington, Wayne Coy, Chairman of the Federal Communications Commission, compared the joining of the two regions by television to "those waves of progress [which] took the form of the overland trails and national roads with their covered wagons, the canals, the railroads, the telegraph, the telephone, the airplane.

"In the twenties it was the radio networks.

"Tonight it is an electronic television highway from the Atlantic Ocean to the Mississippi River."

After touching on the years of research represented and the size of the network, Mr. Coy continued, "Tonight's linking of the East with the Midwest instantly opens up a vast new area of program resources for the television set-owners in each section—programs in the fields of education, the arts and sciences, news and entertainment—programs that can deepen our understanding of democracy.

"Triumphant as this occasion is, we know that it is only one more forward step in television's march of progress. This progress will go on and on until . . . eventually, national television network service is brought to every part of our country. . . ."

The presidents of the four networks then appeared on the opening program to discuss various aspects of the television industry. They were: Allen B. DuMont, head of the DuMont Laboratories; Niles Trammell, of NBC; Frank Stanton, CBS; and Mark Woods, ABC. In addition, Vincent Impellitteri, president of the City Council of New York (representing Mayor William

O'Dwyer, who was unable to be present), and Mayor Martin Kennelly of Chicago spoke from their home cities.

The event attracted wide attention in the trade and general press. *The New York Times* commented editorially on the extension of the network: "Its importance as a technical triumph, of which both the television broadcasters and the American Telephone and Telegraph Company may be justly proud, was self-evident to those in New York who watched Mayor Martin Kennelly as he spoke in Chicago, some 700 air miles away."

The following day, regular commercial service was available to television broadcasters, and from Washington the next week all stations on the enlarged Bell System network broadcast the Inauguration.

Behind the Scenes

THE PERFORMANCE challenged the skill of every telephone man involved, and one broadcasting company president termed the Bell System part in the première "a splendid job."

The television industry is so eager to bring network programs to a larger public that the Bell System is expanding its facilities as early as possible, and under such circumstances our technicians must often work with somewhat limited equipment and under less than ideal conditions. The present television situation reminds old radio broadcasting hands of conditions when *their* field was very new. On the opening night, for example, technicians operated the television network in temporary control rooms in all but two of the cities.

Preparations for the opening had been going on for more than two months, as the link between the two networks—the newly-introduced coaxial cable between Philadelphia and Cleveland—was lined up and tested. Such testing, which involves many changes and adjustments, continued until the initial program was to go on the air.

And there were of course those standard hectic moments which cause people in show business to look upon a bad dress rehearsal as essential to a good performance. On the night before the première, for example, a pilot elimination filter failed in a receiving terminal at New York. Although a new one was rushed in from Western Electric, there still was a joker: such filters take hours to warm up to the temperature at which they will operate without playing hob with pictures on the television receiving sets.

P.S. That trouble was ultimately licked—and the picture *did* get through.

Coaxial and Radio Relay

AS SUGGESTED previously, there are two types of facilities in the Bell System television networks—coaxial cable * and radio relay.

Coaxial cables, which are somewhat larger in diameter than a silver dollar, usually contain eight copper tubes each about the size of a fountain pen. Through the center of each tube runs a copper wire, the size of a pencil lead, which is held in place by insulating discs. Since the tube and inner wire have a common axis, they are co-axial—which accounts for the name given both the cable and its

* See page 23.

tubes. To prevent either telephone or television transmission from fading out over long distances, amplifying stations are placed every eight miles along the cable route.

Properly equipped, each of these tubes carries high frequency signals used to transmit hundreds of telephone conversations or, when additional equipment is installed, a single television program. (As each coaxial tube only transmits in one direction, two tubes are needed for a telephone conversation.) Coaxial cable is usually buried under ground; and its installation is not only an exacting job but it makes an exciting scene, for the construction crews with their mighty plows must conquer timberland, rivers, boulders, and mountain ranges.

RADIO RELAY, the second medium, is a means of communication in which radio signals are beamed across the country from tower to tower. Differing from ordinary radio, it uses super-high frequencies called microwaves, which are about the length of a cigarette. In this system, the signal beam can be focussed like a searchlight and a clear line of sight must exist between the relay buildings, which have directional antennas and are situated about twenty-five miles apart.

Along these routes and in the television terminals of cities on the Bell System networks are large amounts of complex equipment. In the network now in operation, for example, 770 amplifiers maintain the signal energy as it travels from city to city and some 340 additional amplifying devices in the terminals in key telephone buildings are necessary to put the broadcasters' programs on the channels.

Checking and More Checking

IN ADDITION to those telephone men who were trained in handling local phases of the program, several hundred Long Lines and Associated Company craftsmen were trained during 1948 in the operation of the inter-city television circuits.

Every day, in the control rooms along the routes, the technicians who maintain and operate the television networks line up and adjust the facilities before broadcasts are scheduled to begin. Shortly before a show is to start, test pictures and patterns are also sent out to stations about to receive a particular program, such pre-broadcast tests being made to check the fidelity of the transmission signal. In addition, during the actual broadcast Long Lines and Associated Company technicians observe the picture and sound quality on monitoring equipment.

Above all, these technicians must meet that conspicuous test of good workmanship: the switch. This is a swift re-arrangement of network channels. Guided by the broadcasters' schedules, the technicians must be prepared to add or cut stations from the networks as well as to shift to whatever station is to originate a program. In addition, these precisionists must test the performance, coördinate, and switch the accompanying sound channels, which are routed over separate circuits.

Finally, they give routine performance tests to the hundreds of amplifying devices in the television terminals and in the stations along the

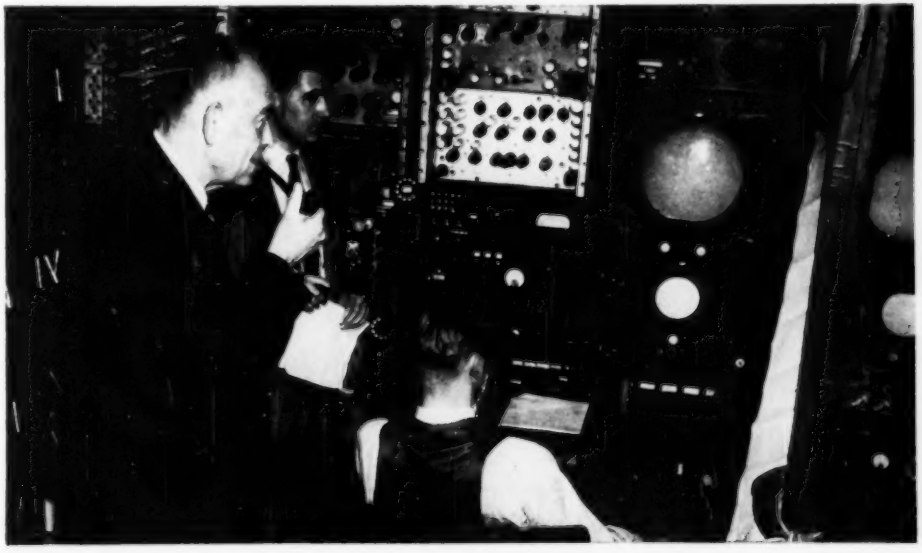
coaxial cable, to make sure they are in proper operating condition. And the radio relay equipment must also undergo similar inspection and adjustment.

How much television broadcasters use these inter-city facilities is illustrated by program transmission on a typical recent day. Broadcasters used our television channels between New York and Washington on an average of 30 hours per day, which is more than seven times as much as when service was first put on a commercial basis in May a year ago. Between New York and Chicago, such usage averages about 25 hours per day—more than four times that when service on this route was opened last January.

A Growing Service

GROWTH is the very theme of television today. Plans for increasing our facilities depend, of course, on the development and needs of the television industry. A highly fluid situation, it is consequently under constant review by the interested parties. The Bell System position was stated by Mr. Wilson when, in announcing the inaugural program marking the linking of our networks last January, he referred to our intention of providing those inter-city facilities "which will make it possible for the television industry to bring programs to a constantly expanding audience."

To implement this position, our plans call for more television channels along the existing main routes of the Bell System television networks and extensions as well from the present network to additional cities. Under the 1949 program, for example, more cities in New England, New York, Pennsylvania, and the Midwest, and on the West Coast will be provided with service. Extensions to still more points are planned for 1950 and



The control room of a television transmitting station

A Bell System technician checks the quality of television image and sound on monitoring equipment at a control center along one of the television networks

vision industry as well as a splendid example of coördination on the part of its various components—the Bell Laboratories, the Western Electric Company, the Associated Companies, and the Long Lines Department.

On the West Coast, a radio relay circuit is being built this year between Los Angeles and San Francisco, which will form the basis for network service in that area. And all during 1949, work is going forward on the important radio-relay project which will provide more later. More than that, not only has the Long Lines recently doubled the number of channels on its main trunk route between Philadelphia and Chicago but it put these channels into service ahead of the date originally set.

Such a revision in schedule was no light change to undertake, as it raised a whole series of problems in planning, timing, technique, supply, construction, and manpower. It is, however, excellent evidence of the Bell System's response to the requirements of the tele-

Some of the terminal equipment of the Bell System's long distance micro-wave radio relay system in the Long Lines building in New York

television and long distance telephone service between New York and Chicago, and beyond to Des Moines next year. In 1950, television service from Des Moines will be extended to Minneapolis and St. Paul by coaxial cable.

Improved equipment, which includes a new vacuum tube developed by the Bell Telephone Laboratories, will mark this new radio relay system, making it an advance over the facilities between New York and Boston introduced in November, 1947. To speed the project, the Western Electric Company has established an especially fast manufacturing schedule for the new relay equipment to go into the key terminals and the 33 intermediate stations along the route. In addition to benefiting from the experience already gained in operating other Bell System radio relay systems, the new facilities will be simpler to maintain, more reliable, and will ultimately provide more channels than any other micro-wave system in service.

By its activities in the field of television, the Bell System is playing a role in the latest and most exciting communications development. But there is more to the story than that. For as its projects come to life, they make clear how the teamwork of Bell System men and women, busy in scores of departments of the various coöperating companies, can create a new service for the benefit of the public.

Neither chance nor mere good fortune has brought this nation the finest telephone service in the world. The service Americans enjoy in such abundance is directly the product of their own imagination, enterprise and common sense. . . .

In this climate of freedom and responsibility, the Bell System has provided service of steadily increasing value to more and more people. Our policy, often stated, is to give the best possible service at the lowest cost consistent with financial safety and fair treatment of employees. We are organized as we are in order to carry that policy out. Bell Telephone Laboratories leads the world in improving communication devices and techniques. Western Electric Company provides the Bell operating companies with telephone equipment of the highest quality at reasonable prices, and can always be counted on in emergencies to deliver the goods whenever and wherever needed. The operating telephone companies and the parent company work together so that improvements in one place may spread quickly to others. Because all units of the System have the same service goals great benefits flow to the public.

From the A. T. & T. annual report for 1948.

Above, dialing long distance calls. Operators use sets of keys on the switchboard shelf to dial straight through to distant telephones. Toll dial networks now reach some 300 cities and are expanding. New equipment and methods make possible this important step toward faster, more accurate long distance service

Visitors to Bell System exhibit now touring the country listen to a demonstration of long distance dialing. Other demonstrations of new telephone developments, shown at the exhibit, are among the pictures on the following pages

Looking Ahead with The Bell System

NEW DEVELOPMENTS in telephone service are shown in the pictures on the opposite page and the pages which follow.

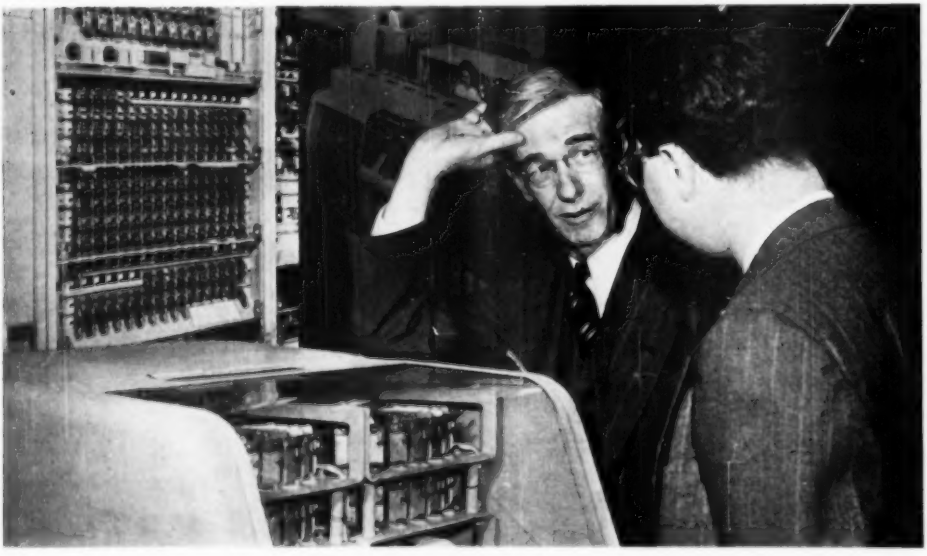
They are new products of Bell Telephone Laboratories, newly made in Western Electric factories, and they form an important part of the Bell System's great post-war program of expansion and improvement.

The list is impressive: direct dialing of calls by long distance operators . . . the automatic recording of accounting details of toll calls . . . more telephones in cars, boats, and moving trains . . . long distance calls and television beamed by radio . . . new networks of an improved type of telephone cable . . . crystals identical with natural quartz, but grown artificially . . . a new amplifier little bigger than a pencil eraser . . .

Several of these recent developments of telephone research were demonstrated to stockholders who attended the Annual Meeting of the A. T. and T. Company in New York on April 20. An exhibition of them is going on tour throughout the country, so that telephone workers and telephone users will have opportunity to see the new devices in operation.

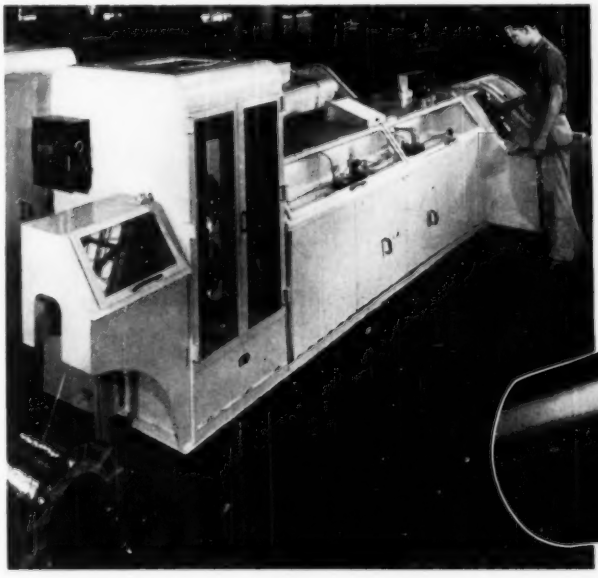
Some are still in the experimental stage; others are already being put to use on a wider and wider scale. But all hold out for the future the promise of a telephone service that grows steadily in its usefulness and value to the user.

Telephone customers in certain metropolitan areas can now dial calls to nearby places in the same way that they dial local calls. An electrical "brain" receives the dialed number and completes the call, while an Automatic Message Accounting system gathers the information necessary for billing



Dr. Vannevar Bush, one of America's foremost scientists and an A. T. & T. Company Director, views the Automatic Message Accounting equipment in the touring Bell System exhibit. The machine punches coded patterns on paper tape to record all the information necessary for billing thousands of toll calls

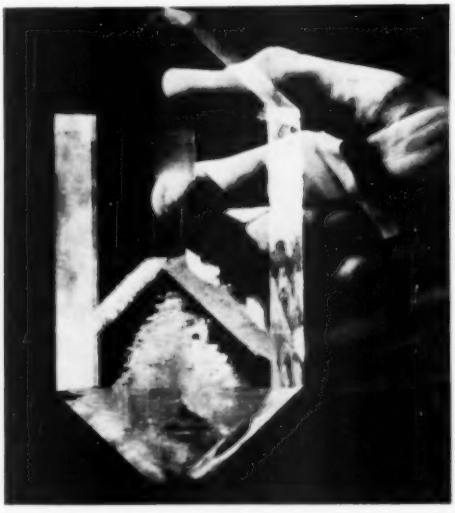
Exhibit visitors see a demonstration of how radio beams, relayed from station to station, can transmit "bundles" of telephone conversations and, in addition, television programs. Another means of accomplishing this is the coaxial cable, shown below. A new development will enable each pair of tubes in this cable to carry either 1800 telephone conversations or 600 conversations and two television channels simultaneously



At left, one step in fabricating coaxial cable in the Point Breeze, Maryland, plant of the Western Electric Company, the manufacturing and supply unit of the Bell System. A section of the cable is shown below

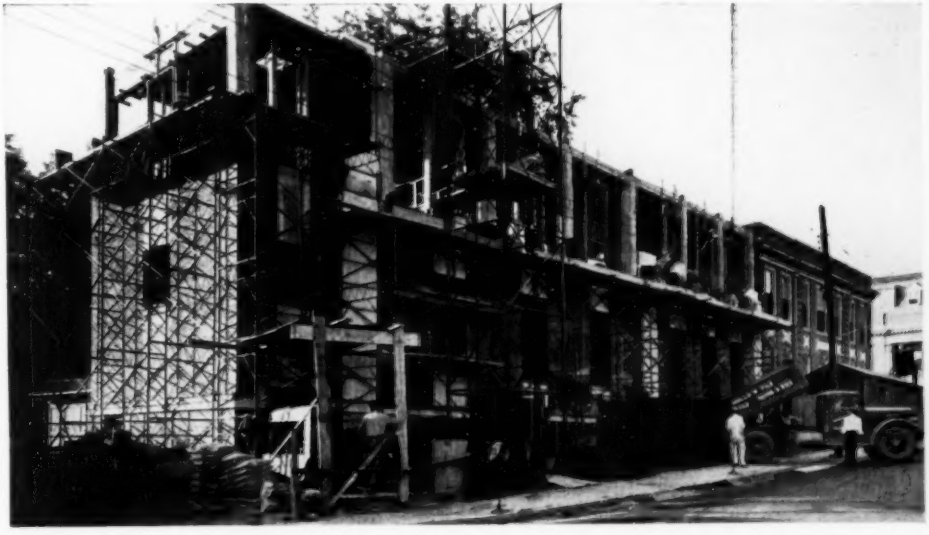
The transistor, a new and amazingly simple electronic amplifier, is demonstrated above. The tiny equipment at the top of the display panel does the work of the bulkier arrangement of vacuum tubes at the bottom. Transistors are based on an entirely new principle and seem destined for many applications in telephony

The transistor's importance to the future of communications is far greater than its tiny size would suggest. Two types are shown above



With natural quartz hard to get, slices of this synthetic crystal will be used in carrying several conversations over the same wires at the same time

Traveling telephones—the Bell System's new mobile service—are now in use in most major cities and on many highways. The service, first introduced in 1946, serves cars, boats, and trains. Above, Miss Joan Blair, a great-granddaughter of Alexander Graham Bell, uses a mobile telephone



Building for the future has called for the biggest Bell System construction program in history. Here a telephone building is being enlarged to house additional dial equipment. In less than four years, busy Western Electric factories have turned out enough equipment and apparatus to serve 10,000,000 new telephones

Telephone service in rural areas is rapidly being extended and improved by fast, economical construction methods and important new techniques. Power-driven pole-hole diggers like the one above have helped the Bell System add a million telephones in farm areas since the war, increasing the number of rural telephones in service by 65 per cent.

The Future Holds Great Promise

THE TELEPHONE is seventy-three years old this year. Its development within a single lifetime has been a modern miracle. Yet this is only the beginning. The future will see greater progress than the past has ever known.

The telephone's future is being built on firm foundations: on the ceaseless search for new and better devices and methods; on the loyalty and skill of hundreds of thousands of men and women who build and operate the voiceways; on the confidence of hundreds of thousands of people in all walks of life who invest their savings to enlarge and improve the telephone plant.

These have given America the best telephone service the world knows today—and for tomorrow they hold out the promise of still greater things to come.

Forces Must Be Increased by as Much as 70 Percent, Many Circuits Re-arranged, and Other Special Measures Taken, to Meet the Great One-Day Traffic Peak of the Year

Merry Christmas in the Toll Offices

Cyril K. Collins

MERRY CHRISTMAS!

The exchange of this greeting by telephone with relatives and friends in distant places is becoming, in more and more American families, an event looked forward to with as much eagerness as is the decoration of the Christmas tree by those gathered at home. This widespread custom develops a peak in long distance calling at Christmas time which far exceeds the capacity of the vast toll networks of the country and presents the telephone companies with one of their most challenging service problems.

The volume of long distance calls offered during Christmas Eve and on Christmas Day is far greater than in any similar period of the year. On Christmas Day, the volume in many cities is more than 50 percent higher than on an ordinary day; in some, the increase is 100 per cent or more.

The problem of handling this great volume is complicated by the fact that these holiday calls do not follow the pattern of the normal traffic for which the toll circuit layout—the great nation-wide network of voice pathways—is designed. As compared to an ordinary day, Christmas calls to nearby points are relatively light. On the other hand, traffic to more distant points increases tremendously. Interstate toll calls range up to more than four times a normal day; calls between certain states increase as much as eight to ten times; and over some transcontinental routes the increase is even more. This heavy traffic to distant points results in severe congestion on the longer-haul circuit routes.

The situation on the telephone highways at Christmas time is not unlike that which exists on automobile highways around many large cities in the latter part of a beautiful summer Sunday afternoon, when all cars turn toward home. The local

streets, so busy on a weekday, are nearly deserted. On the other hand, the main arteries are congested, cars are lined up bumper to bumper, and hours are required to travel distances which may be covered in minutes on an ordinary day.

CHRISTMAS HOLIDAY TRAFFIC has other unusual characteristics which make the calls more difficult to handle, and take more operating time per call, than on normal days.

Calls fan out much more to small communities, greatly increasing the amount of switching involved.

More calls are placed without the called number, people answer the telephone more slowly, conversation time is longer. More calls come from public telephones, more "don't answers" are encountered, than on a normal day.

The time required to record calls is increased because of the diverse nature of requests and the necessity for quoting delays and explaining the situation to customers.

Additional operating time is consumed in securing route and rate information to points infrequently called.

The number of switchboard signals to be answered is increased by requests from customers for information about calls previously placed.

The net effect is that the increase in requirements for circuits, switchboards, and operators is much greater than the increase in calls.

Despite greatly expanded operating forces and the use of every available toll facility, many calls encounter delay. Although the great majority of calls are completed, some are not. The customers' consequent

Every toll switchboard position is filled on Christmas Day. In this central office, the teams of girls at the temporary tables are helping to speed the calls by relieving the switchboard operators of certain details

Tickets for completed Christmas calls come to these positions for filing. Other tickets are dispatched to delayed-call operators, who try to complete the connections over the the circuits to the called places

disappointment is a matter of real concern not only to the operators who have tried to put the calls through but to the supervisory and executive groups of a business which exists for the purpose of providing such connections promptly and satisfactorily.

The telephone companies take extraordinary steps in preparation for the holiday, so that the greatest possible number of people may exchange greetings by telephone at Christmas time.

They re-arrange existing and provide additional toll circuits. They have supplemental operating positions installed.

They introduce special procedures to utilize available facilities most efficiently. They provide and train a great many operators.

And they do a good deal of special advertising so that people may understand the situation.

Re-arranging Toll Circuits

THE OBJECTIVE of holiday circuit planning has been to re-arrange toll circuits to meet as closely as possible the flow of traffic, and to relieve large switching centers where the switchboard positions are inadequate to handle the tremendously increased work load under the conditions that exist on Christmas.

As long as 20 years ago, long-haul circuits were re-arranged, and some circuits terminating at switching offices were "patched" * together to provide temporary direct circuits and thereby decrease the amount of traffic which otherwise would have to be handled at the switching offices. At first, re-arrangements involved primarily the shifting of some of the

* Two circuits may be "patched" together at a test board to become one direct circuit, by connecting them with a "patching" or connecting cord.

Operating forces in toll offices across the country last Christmas were increased on the average about 70 percent. These force clerks in a toll office are preparing assignments of operators for the day

transcontinental circuit terminations from congested centers to smaller offices. As time went on, this activity was extended until, in 1940, 60 percent of the long-haul circuit groups were involved in re-arrangements and some 200 temporary direct-circuit groups were established in order to decrease switching.

During the war years, however, circuit re-arrangements for Christmas were largely limited to those providing all possible facilities for training camps, embarkation points, and military hospitals, so that the men and women in the services could talk to their families or sweethearts.

Following the war, re-arrangements of circuits for the holiday were resumed, and reached an all-time high in 1948. The Traffic Department circuit control bureaus—in New York, Chicago, Cleveland, and San Francisco—issued orders to establish over 900 temporary direct-circuit groups for last Christmas.

Such re-arrangements are a very large undertaking. An immense amount of preparatory work has to be done by the Long Lines and Associated Company circuit people to determine, from studies of traffic of the previous Christmas, which new direct-circuit groups would be the most helpful.

The over-all patching requirements are then worked out among the companies involved, and the total number of circuits to be removed from normal groups in order to make up the temporary direct groups is determined.

The various plant testboard groups are queried to determine the specific circuits and associated facilities to be used for the patches. The entire network is then reviewed to determine possibilities for additional circuits for the more seriously overloaded groups and replacements for the circuits used to create temporary direct groups.

Final circuit plans are then transmitted to toll line engineers of all the Associated Companies, listing the new direct groups, the type of traffic to be handled, and instructions as to any routing changes involved.

And, before Christmas, a complete check is made to see that all planned re-arrangements have actually been completed.

The execution of the circuit patches and re-arrangements requires quite a plant organization job and an increase of the plant forces on duty. Physically, it is possible to patch any circuit to any other circuit. However, where different types of circuits, terminal arrangements, and signalling facilities are in use, extra work is required to make such circuits work properly when patched. In addition, amplifying adjustments are required in many cases to insure that the two parts of the new circuit will work together as though they were one. Careful coördination in all these changes is required among the test men at all offices involved.

Use of teletypewriter circuits to advise toll offices of delays at an important switching point enables operators to give correct information to customers and also leaves voice circuits free for talking

Throughout the holiday period, special consideration is given to force coverage in the traffic circuit control bureaus and in the plant test and terminal rooms, to insure prompt action in case of trouble with the equipment. Linemen and cablemen are on duty where the situation requires, and arrangements are made so that those not on duty may be reached if the need arises. Plant administrative offices are also covered as required.

It is fortunate that, in recent years, there have been no storms of serious proportions over a wide section of the country on Christmas. There have been, however, a number of localized storm troubles which have added to the difficulties of the day.

Supplemental Operating Positions and Other Special Facilities

IN MOST TOLL OFFICES, the number of switchboard positions installed is not sufficient to meet the requirements on Christmas, because of the increased volume of holiday traffic and greater work time per call. This is particularly true at large switching offices. Much development work has been done, and local ingenuity exercised, in an effort to provide "relief"

With operating requirements at a peak, most toll operators work on Christmas day and do so cheerfully, realizing that they are making a vital contribution to the holiday happiness of the American public. They appreciate that a Christmas message is one of the most important of the year; if calls cannot be completed, they are as disappointed as the customer. Absence on Christmas is consistently lower than on an average day, showing the additional effort operators make to overcome obstacles of all kinds in order to be on duty. It is a tribute to their spirit of service that many volunteer to work beyond their normal assignment when the need is indicated.

short of installing regular positions for this one-day peak.

All possible work auxiliary to the actual establishing of connections is removed from the switchboards and handled on temporary tables equipped for this purpose—including recording calls from customers and orders for circuits from other operators, sorting and filing delayed tickets, and giving reports to customers about the progress of their calls.

LOCAL DIAL OFFICE switchboards which are not heavily loaded on Christmas are adapted for handling long distance calls.

Outward toll positions are arranged for handling inward and through calls, where advantageous, to balance the load between boards.

A number of offices have installed arrangements for making posted delay information available to operators promptly by means of distinctive tones which are associated with the circuit groups involved.

Special Operating Methods and Procedures

OVER THE YEARS, many special operating methods have been used in an effort to make most efficient use of the available facilities. While these methods differ in various details, they all have the general objective of utilizing a higher percentage of the available circuit time for conversation by reducing the amount of operating work that has to be done over the circuits.

One method was the "utility" method, whereby a team, consisting of a circuit operator and two report operators for dealing with customers, is used at each end of a circuit group. There was also an "operator per circuit" method, under which one operator is assigned at each office for each circuit. Then there was the "concentration" method, where special operators have control of one circuit group.

Under these methods, the same operators handled outward, inward, and through calls. A teletypewriter was sometimes used with these methods, to reduce further the amount of operating work done over the telephone circuit.

All of these special methods were helpful in obtaining more efficient circuit usage; but they did so, necessarily, at the cost of greatly increased requirements in switchboard positions and operators. As the number of circuit groups over which calls had to be handled on a delay basis increased, it was more and more difficult to provide the necessary facilities and operators. Also, these methods required a very high degree of coordination and teamwork between the

operators involved at both ends of the circuits, and this coördination could be obtained only by means of intensive training and actual practice. In the over-all, it was not found practicable to train the number of operators required in the more complicated methods for use only on one day in the year.

For these reasons, special-method operation has been used in the past few years on only a relatively small number of the most congested circuit groups and has been limited generally to the "concentration" method, which is the least complicated of the special methods and requires the smallest number of positions for a given number of circuits.

There are, nevertheless, special procedures of a supervisory and management nature which are used to facilitate call handling and improve completion and speed of service under the unusual and difficult conditions at Christmas time. Many of these special procedures are of a technical nature relating to the application of the operating practices. Others are more general and include such features as the following:

—providing posted delay information to selected built-up points by means of teletypewriter networks between toll centers, so that operators need not go to intermediate offices on every call to learn of the situation;

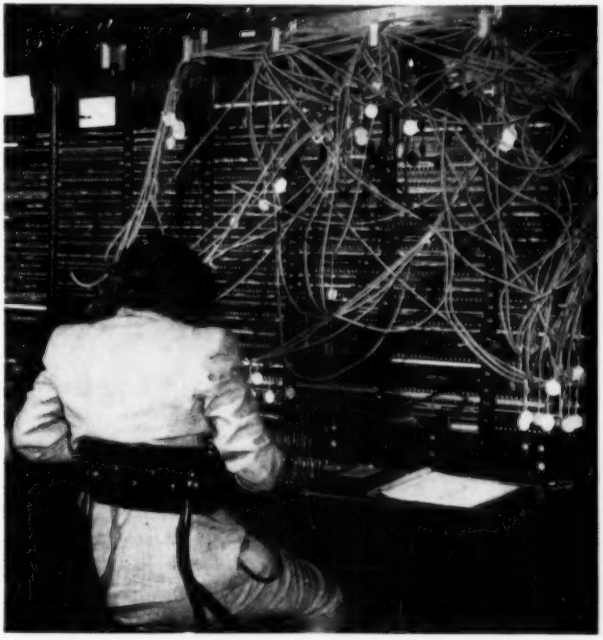
—providing additional ready-reference routing material and called-place directories to expedite handling of calls;

—cancelling alternate routes which would be ineffective in periods of congestion;

—dividing circuit groups directionally, and rotating the use of some circuits among several originating offices, to facilitate the movement of traffic;

—re-arranging the position layout to provide more positions for handling delayed calls.

Special precautions are taken to insure that emergency calls are recognized and promptly handled.



"Patching" two circuits together creates a direct circuit to by-pass a switching office. Some patches are made at Traffic switchboards, as here, and others at Plant test-boards More than 900 were made last Christmas

The attitude and manner of the operators have a definite effect on customers' opinion of the service when calls cannot be handled promptly. Particular care is exercised that attentiveness and courteous consideration be shown on all calls. When a call cannot be completed on Christmas Day because of a circuit delay, the operator is prompt to offer to try to complete it the following day. After Christmas, chief operators often call or write to express their regret to customers whose calls could not be completed on the holiday.

The Operating Force

OBTAINING AND TRAINING the necessary people to meet the greatly increased operating requirements for the holiday period is a major problem.

Adequate forces must be provided at all switchboards and temporary tables to insure prompt answer to signals, to apply the special procedures in effect, and to use the available circuits efficiently.

Good answering service is particularly important at inward, through, and delayed-call positions in toll offices, and at toll switching and information positions in local offices, since slow service at these points has a far-reaching and cumulative effect on the service in other offices.

The magnitude of the force and training task is indicated by the fact that operating forces in toll offices across the country this past Christmas were increased on the average about 70 percent.

Estimates of Christmas traffic and force requirements have to be made sufficiently in advance to insure adequate time in which to carry out the plans for securing additional people, completing the required training, and installing any additional operating fa-

This display board in the Long Lines circuit control office in New York gives a visual record of the status of all long distance circuits out of the city, including those temporarily "patched" for Christmas traffic

cilities to be provided. Judgment, and experience with previous holiday conditions, are needed to allow for unusual local circumstances and to compute separately the force needed for each different class of work. There is always the danger of underestimating the force requirements, since work time per call is so much higher than under normal conditions.

In order to provide the required number of people, every available source must be drawn upon, including, in addition to the regular force, former employees, clerical forces, employees from local offices, and employees borrowed from other departments, and still a good deal of overtime work is necessary.

THE ADVANCE TRAINING for the holiday is a big undertaking. It is necessary to review with all toll central office people the operating practices related to the handling of calls under congested circuit conditions, which they use only infrequently; to retrain many of the force for operating at a different type of switchboard; and to provide special training for those who will be involved in a special-method operation or work at a temporary table position. Basic training must be given to the large number of temporary people who have had no previous toll experience. All this must be started many weeks before Christmas, to cover the entire force and to allow time for the practice which is needed to develop skill and efficiency.

As Christmas Day draws near, telephone buildings take on a festive appearance, with Christmas trees and decorations skillfully arranged, usually by the girls themselves. In buildings large enough to have cafeterias, attractive and appetizing food awaits the employees in plenty, whether their needs be a complete Christmas dinner or merely a refreshing snack.

Preparations among the employees for Christmas are not exclusively concerned with the problem of handling telephone traffic—recognition also is given to the spirit of the holiday season. Traditionally thoughtful of others, groups of operators and other telephone women combine their efforts to provide a merrier Christmas for the unfortunate. Thousands of dolls are obtained and dressed for distribution to underprivileged children; some groups of telephone men and women "adopt" needy families and send clothing and baskets of food; others send gifts to wounded veterans; some spread their cheer through churches, institutions, and charitable groups.

Independent Companies

THE TASK of completing toll calls during the holiday season requires the closest coöperation and teamwork in all the nation's telephone exchanges, Bell or Independent. There are approximately 6000 independently-owned telephone companies in the country, serving some six million telephones.* These companies play an important part in moving holiday toll traffic, and the service they render on interconnecting calls has a large bearing on the over-all quality of service. Every year, as a part of the Christmas planning, meetings and discussions are held with the Independent companies to review the significant holiday practices and procedures.

* See "Six Thousand Telephone Companies Serve U. S.," MAGAZINE, Winter, 1948–49.

We get more long distance calls at Christmas than can go through
Seems 'most everyone likes to make long distance calls on Christmas Eve and Christmas Day. In spite of all we can do, lines will be crowded . . . calls will stack up . . . and some folks are bound to be disappointed.
Best time to make holiday calls: Before Christmas Eve or after Christmas Day
The Pacific Telephone
Telephone highways, too, will be crowded this Christmas
Dodge the Long Distance rush by calling before Christmas Eve, or Sunday the day after Christmas
ILLINOIS BELL TELEPHONE COMPANY
Long Distance calls hit the TOP at Christmas
SOUTHWESTERN BELL TELEPHONE COMPANY
Long Distance telephone calls will pile up, too, this Christmas. We'll be right on the job with every circuit and switchboard in service. Still, there will be delays. To avoid the rush, make your calls before Christmas Eve or after Christmas Day. Indiana Bell Telephone Company.
There'll be a Christmas rush on Long Distance, too
Seems as if everybody wants to use the Long Distance telephone lines at Christmas. This year's rush will be bigger than ever. We'll be working hard to get calls through, with every switchboard and circuit in service. Still there are bound to be delays.
If you're planning to call faraway friends and relatives, why not do it before Christmas Eve or after Christmas Day? You'll get faster service.
The Chesapeake & Potomac Telephone Company

Here are a few examples of how the telephone companies fulfill their obligation to keep the public informed about the traffic situation on Christmas Day

Overseas Calling

THERE IS also a tremendous increase in calls to overseas points at Christmas time.

The first overseas Christmas call took place between the United States and England in 1927; from the 44 Christmas messages handled on a single circuit that first year, the volume has grown to more than 3400 messages, reaching out to 80 countries. Overseas calls in 1927 were handled on three switchboard positions in New York; now over 150 positions and 550 operators are used in the four cities where the radio circuits are terminated: New York, Miami, San Francisco, Seattle.

Christmas-day calls completed number about twice those of an average business day. In order to accomplish this, many preparations are required. An estimate is made of the total number of calls which can be handled in both directions over the maximum facilities which can be provided. An agreement is reached with each foreign country as to the maximum periods during which each circuit will be operated on Christmas.

Calls are booked at each end, in accordance with the service schedules agreed upon and the capacity of the circuits provided. Circuit usage is divided on the basis of relative bookings at both ends, and calls are completed in the order of booking. Ninety percent of the Christmas overseas traffic is booked in advance, and in some years booking has commenced as early as the preceding July.

One of the chief difficulties in completing overseas calls lies in the fact that only 15 percent of the calls originate or terminate at the city where the radio circuit is terminated. An additional 20 percent involve cities reached by direct circuit, leaving 65 percent originating or terminating in cities requiring one or more switches on this continent. Thus the circuit delays encountered on land traffic also handicap the completing of overseas calls.

Despite the pressure of so many calls, the Christmas spirit pervades the telephone buildings, and there the operators can obtain a turkey dinner—or just a snack during a relief period

Informing Our Customers

THE TELEPHONE COMPANIES have long recognized that a wide public understanding of the toll situation at Christmas time is very helpful.

Use is made of advertising, and other media such as bill inserts and radio announcements, to inform the public in advance of the holiday that (1) toll calling on Christmas Eve and Christmas Day is at a peak and those who call may encounter delays, (2) the telephone companies are stretching their facilities to the limit to put calls through but no amount of diligence and effort can prevent some delays because of the tremendous volume of calls on these two days, and (3) calls made before December 24 or after December 25 will avoid the rush and get faster service.

The tolerance and coöperative attitude of customers whose calls are delayed indicate that they appreciate that the telephone companies are doing their utmost under difficult conditions.

CONSIDERING the tremendous increase in volume and the other unusual characteristics of the traffic, the problem of giving the American people good service on their long distance calls at Christmas time is one of the most difficult ever presented to the men and women of the Bell System. It is being attacked with vigor and imagination, and considerable progress has already been made. Nevertheless, much remains to be accomplished. And all who are concerned with the problem are continuing to seek better ways to use the available facilities, so that more and more people can talk to anyone, anywhere, at Christmas time.

TAXES PAID by the [Bell System] Telephone Companies in 1948 amounted to $292,477,000, and Federal excise taxes paid by customers and remitted by the Companies to the United States Treasury came to $406,000,000—a total of about $700,000,000, or nearly $2 a month for every telephone in service. Telephone excise taxes paid by customers are more than double the increase in telephone rates since the war. Taxes paid by the Telephone Companies and Western Electric exceeded the total amount which remained available for interest and dividends.

From the A. T. & T. annual report for 1948.

A Hundred Million Personal Contacts a Year With Customers Give These Young Women Great Opportunity To Earn Good Will for Themselves and Their Companies

You Can Tell by the Teller

Arthur F. Leet

THE OPERATING COMPANIES of the Bell System believe that *you can tell by the teller* the character and spirit of the organization she represents.

The teller is the pleasant young woman in the telephone business office to whom customers pay their bills; and, as in the case of the organization itself, she must be accurate and prompt in attending to customers. But efficiency is not enough. In dealing with customers there must also be courtesy, understanding, a sincere interest in trying to please, and evidence of a helpful attitude.

The opportunities the teller has to demonstrate this spirit of the organization are important for two reasons. First, it is fitting that a customer coming to an office to pay us his good money should be made to feel that his patronage is appreciated. Second, there are about 100,000,000 contacts a year with customers who come to the public offices to pay their bills.

To make this idea of pleasing service a reality requires special attention to selecting for tellers women who will be both efficient and qualified to do a good customer relations job. It also requires giving the tellers proper training and providing working conditions, arrangements, and supervision to carry forward the idea. The results have been gratifying. This concept of the tellers' responsibilities makes the job more interesting to them. The response of the public indicates appreciation. It does not take any more time to be courteous and try to please customers, experience shows, than it does to be indifferent.

The company selects for public-office teller positions personable young women who are alert and accurate, with quick minds, poise, ready smiles and good voices, and with the ability to express themselves. Preferably they should show promise of advancing to even better jobs. These tellers usually are chosen from women who have been trained and have had at least several weeks' experience in handling payments received by mail. They are, therefore, proficient in

The teller personifies the character and spirit of the organization she represents

many clerical operations which they will perform on their new jobs as public office tellers.

Training and Supervision

BEFORE beginning to work as public-office teller, each candidate receives three to five days' classroom instruction. While most of the training concerns the principles of the job, much of it consists of practicing the handling of payments at a "dummy" payment counter, with the instructor acting the part of the customer. Continuously during this training, special emphasis is given to the customer relations aspects of the job, along with the procedures for the proper handling of money and the associated record work. In teaching, the instructors use a written manual covering theory and details of practice cases. Very effective use is made of a Bell System motion picture entitled "You Can Tell By The Teller." This movie, which shows customers paying their bills at a business office, illustrates the value of the customer relations aspects of the job as well as efficient clerical procedures.

Tellers are taught to greet the customer with a friendly smile and a cheerful "Good morning," "How are you?" or other appropriate salutation; to use their "Paid" stamp quietly; to avoid giving customers an unwanted bulk of change and to count out the change into the customer's hand; to notice the name on the bill and thank the customer by name if the name appears to be his.

Of course, the tellers' training also includes clerical proficiency. They are taught proper methods and hand motions, and how to recognize immediately the various types of standard United States paper money and coins and what to do if some one presents to them what appears to be non-standard money. Effective use is made here of the well-known motion picture "Doubtful Dollars," which shows how to distinguish between good and bad money.

The student is coached until she is ready to meet her public. Then she is assigned to a position at the payment counter in a public office to receive actual payments from customers. The instructor stays at her side as long as necessary to develop her proficiency in all aspects of her new job. Then and only then does the instructor deliver her protegé to the supervisor who will guide and coach the new teller in her daily work.

It is a part of the job of supervisory people to maintain the interest of their forces and inculcate a pride of accomplishment in the way their people do their jobs—from the standpoint of both efficiency and "overtones." So strongly is this idea ingrained that many supervisory officials, when visiting business offices, have developed a habit of always making a sample count of the number of contacts a teller has and seeing on how many she smiles and puts the change in the customer's hand. The tellers are kept informed of the impressions of supervisory people regarding their work and of the comments of customers.

Office Quarters and Equipment

THE ASSOCIATED COMPANIES further promote good payment service by seeing that the offices where people

Before her assignment as a public-office teller, each candidate receives three to five days' classroom instruction. Much of it comes at a "dummy" payment counter, with an instructor playing customer

come to pay their bills are convenient for customers and employees and are well designed and appropriately furnished and decorated. This involves, first, care in establishing and equipping offices, taking into consideration such matters as population growth, location of shopping centers, and transportation; and, second, good taste in office design, selection of furnishings, and decorative treatment.

The companies also try to plan layouts, arrangements, and construction details to keep the offices quiet. Tellers' cages with grills or unsightly barriers between the tellers and customers generally have been replaced with open payment counters or desks. Over the years, many changes in the design of payment counters have been incorporated to make them still more convenient for customers and tellers. The changes included a more convenient height of counter; reduced width of the counter, making it easier for tellers to pick up bills and money and to pay out change into the customer's hand; and improved ventilation at tellers' positions. Tellers are equipped with foot stools and comfortable "posture-type" chairs. All these things are done to assure good working conditions and give the tellers the proper tools to make their jobs easy and attractive.

What the Public Thinks

"THIS STORY sounds fine," some people might say; "but is the kind of service described here actually being given in the business offices—and does it pay off?"

In answer to the first question—all of the Associated Companies recognize the importance of good overtones as well as good techniques in handling public-office payments, and the ideas and training procedures here described have spread fast among them. As regards the second question—sincerely trying to please customers has brought its re-

ward through appreciative comments from many. Here are a few samples:

A customer in an Eastern city wrote to the telephone company: "I want to compliment you and your courteous employees. It was a real joy to be spoken to and dealt with so politely. I am sure there are many who agree with me and indeed you have much to be proud of."

A lady called a Midwestern business office to ask, "Where does your company get the lovely girls for cashiers? They are such nice girls, as well as efficient. I certainly think your company uses good judgment in selecting these girls. I just want the girls and the management to know it."

A vice president of a Midwestern advertising agency said, "I am always impressed with the personal and courteous service rendered by the telephone company in this business office. Your charming girls make it a pleasure for me to pay my bill. I like the way they greet me with a smiling 'Hello,' take my bill and money and tell me it is $4.58 out of $10 and then give me my change with a 'Thank you, Mr. Davis.' That kind of service is so far superior to anything I have seen that I cannot leave without telling you how I feel."

Tellers are trained to count the change, aloud, into the customer's hand, so that he can verify the accuracy of the amount and be free to leave with his money in his hand

A man approached a supervisor in a Western business office and said, "When I got up this morning I thought it was going to be a bad day for me and I thought it would be a good day to pay my telephone bill. But when I got to the cashier's counter, she greeted me with 'Good morning' and a smile. After giving me my receipt and change, she thanked me by name. I wanted you to know about it, because I feel it will change my entire day for me."

The sales manager of a packing house was so pleased at the payment service he received when he paid his bill that he suggested to men at his table at a Chamber of Commerce banquet that they should visit the

Modern payment counters are both convenient for the transaction of business and attractive in appearance

telephone company business office and study the tellers' methods.

Other customers have said such things as: "We don't mind paying when we get such a pleasant smile"; "My but the service here is marvelous"; "I always like to pay my phone bill—you girls have such a delightful manner."

What the Tellers Think

MANY tellers have voluntarily made to their supervisors comments which indicate that tellers enjoy real pride of accomplishment in their customer relations and find the work of handling payments pleasant and interesting. For example:

A teller in an Eastern office remarked, "I now have a swell time walking out to lunch because it seems as if everybody on the street speaks to me."

Another teller in a Midwestern city commented on her discovery that a pleasant voice and a smile caused a similar reaction in the people whom she greeted; and said that to her amazement, when she tried it out on her friends, it worked as well as it did in the office.

In one office, a customer walked away from the counter with a big smile on his face, and the teller said to the other girls in the group, "That's why I like my job: I smile, the customer smiles—why we might get all the people in town smiling."

EXPERIENCE in this work of receiving payments affords another demonstration that in many different types of activity there are real opportunities to contribute to good service and good customer relations, even though these opportunities may not be self-evident at first sight. Receiving a payment seemingly is a minor operation which takes, on the average, only 22 seconds. But the number of payments is so large that in total the person-to-person contacts with customers are an important factor in satisfactory customer relations.

From 27,000 Suppliers Come the Raw Materials and the Stocks of 30,000 Different Items Needed for Operation and Maintenance of the Bell System

Purchasing by the Western Electric Company

George deMare

This is the fifth in a series of articles describing the Western Electric Company's operations and its place in the Bell System organization. See in the MAGAZINE *the following: "Nassau: The Bell System's Conservation Specialist," Winter 1946–47; "Distribution by Western Electric Company," Autumn 1947; "How Western Electric Serves Telephone Users," Autumn 1948; "Installation by Western Electric Company," Winter 1948–49.*—Editor.

AS THE manufacturing and supply unit of the Bell System, the Western Electric Company plans and executes one of the largest and most complex procurement programs in industry.

The Bell System's intricate and delicately balanced $8,500,000,000 plant requires year-in and year-out sustenance in the form of raw materials of all types, from steel to acid soda, from aluminum to mercury, from molybdenum to zinc, to be converted by Western into plant equipment; and it also requires accessory finished products from other suppliers that range from paper clips to heavy trucks, from moisture-resistant silk to porcelain knobs, from light bulbs to nylon yarns—some 30,000 different items.

The responsibility for procuring this raw material and these finished items falls mainly upon Western Electric, and more particularly upon Western Electric's Purchasing Division. The logical and successful program by which Western has largely undertaken purchasing operations for the Associated Companies is based on the inherent advantages and savings of scientific centralized purchasing. The story of this scientific centralized purchasing operation for the System's 23 Associated Companies is, in the main, a story of impressive economies together with assured high standard of quality and dependability of supply of the items procured—advantages which for several decades and particularly during times of emergency and

war have been demonstrated again and again.

The instrument which lies at the foundation of this centralized purchasing operation is the Standard Supply Contract which each of the 23 Bell telephone companies has entered into with Western Electric. This contract requires Western Electric to do everything it reasonably can to supply the Bell telephone companies with whatever they may want, when they want it; but it does not bind the telephone companies to purchase exclusively from or through Western Electric. The fact that the telephone companies look to Western for such a large proportion of their material needs is evidence that they find it advantageous to do so.

Some of the advantages of this system may become even more apparent by considering what the cost of purchasing operations would be if there were no Western Electric purchasing and distributing units for the Associated Companies. Each telephone company or group of companies would then have to maintain its own purchasing and stores organizations and be obliged to purchase in smaller quantities. The cost to each company of maintaining its own purchasing and stores organization would obviously greatly increase the cost of procuring and distributing the materials. It was such a situation, in fact, which brought about the present program of centralized purchasing by Western for the whole System.

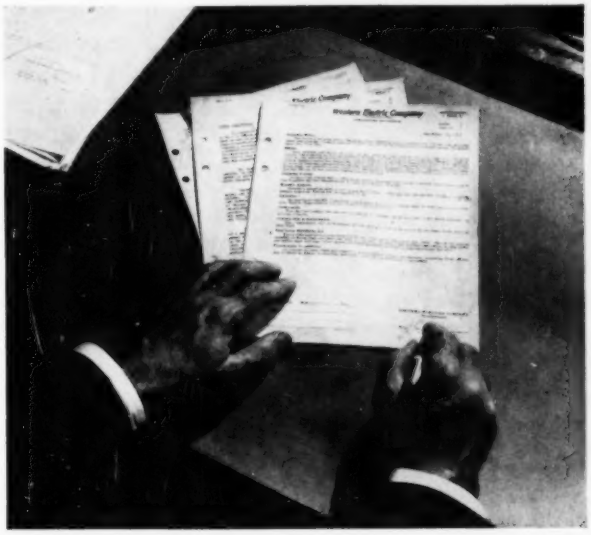
On this circular file at one of Western Electric's Works are the names and addresses of thousands of suppliers from whom Western's Purchasing men buy

A Billion Dollars' Worth of Shopping

THE MAGNITUDE of this job under ordinary circumstances is quite apparent, but in a time of expansion it becomes truly impressive. Since V-J Day, Western's Purchasing people have spent more than $1,000,000,000 in buying raw materials and supplies for the Bell System from 27,000 firms in more than 2,600 cities and towns throughout the 48 States as well as in several foreign countries.

These purchasing operations fall naturally into two major categories: first, procurement of raw materials, machinery, and supplies for use by the Company itself in manufacturing the equipment it produces for the Bell Sys-

tem; and, second, the procurement of finished items which Western does not manufacture but which it is called upon to supply to the telephone companies to fill their varied needs. Last year alone, Western's Bell System purchases—both raw materials and finished products—totaled approximately half a billion dollars.



When Western Electric goes shopping for the thousands of items the Bell System uses, it does so in orderly fashion by means of contracts such as this

To purchase these raw materials and the thousands of items embraced in the classes of finished products requires more than just going to the corner store and giving an order. Western is committed to make every reasonable effort to supply what the Bell System wants when it wants it at the lowest price consistent with quality and service. This means that three factors must be considered: (1) finding and developing reliable sources of supply; (2) setting up standards of quality and insuring that the quality of the materials purchased meets those standards; and (3) getting the best price obtainable under the circumstances for the product.

Finding Reliable Sources of Supply

FINDING AND DEVELOPING reliable sources of supply is one of Western Electric Purchasing Division's main jobs. And it is a complex one. Purchasing specialists travel by plane, train, bus, and automobile as many as 100,000 miles a year to secure needed materials and supplies for the Bell System. One Western Electric buyer made a single trip of 7,000 miles through the Northwest and Mountain States areas to secure additional lodgepole pine telephone poles, while another traveled throughout the south in search of additional southern pine poles, and still another cruised the locust-tree country from Virginia to the Mississippi to discover new sources of supply for locust insulator pins.

Developing reliable sources of supply often requires special effort and ingenuity.

Take the case of zinc. Zinc was one of the raw materials so urgently needed during the recent expansion in Western's telephone instrument, strand, and pole-line hardware programs, to help the Bell System meet the backed-up demand for telephone

In a typical post-war year, the W. E. Purchasing group bought millions of dollars' worth of raw materials from suppliers in the United States and all over the world, including about 90,000 tons of steel, more than 100,000 tons of copper, more than 100,000 tons of lead, 7,000 tons of cable paper, 6,500 tons of wood pulp for cable insulation, 7,000,000 pounds of cotton yarn, and 2,000,000 pounds of acetate rayon yarn.

service. Zinc is chiefly used in Western's manufacturing operations for die casting, galvanizing, and in the brass mills at Hawthorne Works. When these programs were expanded, Western required almost double the amount of zinc ordinarily needed. And this came at a time when one-fourth of the zinc industry was shut down by labor disputes and zinc was at the height of its demand.

By intensive negotiations, Western's purchasing men not only broadened their domestic sources but also managed to secure supplies of the metal from the Hudson Bay region and British Columbia, to borrow from a commercial die caster while supplies were being developed, and to ease the brass situation in the Hawthorne Works by purchasing 300,000 pounds of scrap brass cartridge shells.

In addition, by arranging for suppliers to hold impurities below their normal maximum limits, substitutions of more plentiful grades were made for the scarce grades on which Western was previously dependent.

Western's purchasing specialists, accustomed to meeting such situations, took this one in their stride as almost a routine assignment.

In the case of many finished items, however, it is sometimes necessary to assist suppliers in one way or another to enable them to meet Western's requirements. For example, in order to interest printers in making the large expenditures required for additional equipment needed in publishing the ever-growing Bell System telephone directories, Western found it necessary to negotiate long-term contracts with certain of its printing contractors covering periods up to ten years. Three such contracts were recently made involving a total of $1,250,000 in new equipment, plus $500,000 in new buildings. These arrangements insured a shortened delivery period for telephone directories, and gave the telephone companies better directories at a lower cost per thousand printed pages.

Another case involved the production of steel wire. It appeared that, owing to the steel shortage, Western might fail by 25 per cent to meet the Bell System's requirements for one recent year. Western's established suppliers had excess wire drawing facilities, but were unable to obtain rod from the rolling mills—which in turn were unable to obtain billets. To solve this problem, Western purchased 9,000 tons of special billets from one mill, had them converted into rod by another, and had the rod delivered to the suppliers who had extra facilities for drawing it into wire. This was a costly procedure; but it gave the telephone companies desperately needed wire not otherwise obtainable, and enabled them to expedite telephone service to thousands of new subscribers.

Still another instance indicates once more the advantages of having a cen-

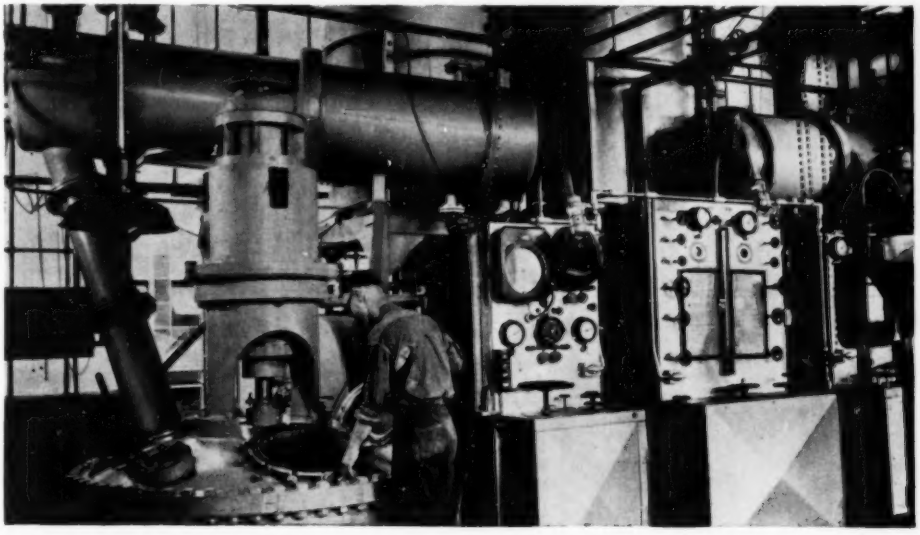
tralized purchasing unit capable of making unusual arrangements to secure vital raw materials. In one year the Bell System expansion program required up to 50,000,000 duct feet of clay conduit. This exceeded the productive capacity of the four plants producing clay conduit after V-J Day. It was thus necessary for Western to assist in financing the rehabilitation of three plants which had been shut down for many years, to have another plant completely rebuilt, and to increase manufacturing facilities in existing plants.

These are a few of many examples which demonstrate the unusual efforts which Western must make to keep the world's greatest communications system supplied with sufficient materials for its efficient functioning—efforts which it would be difficult for a number of smaller competing purchasing units to match.

Maintaining Bell System Standards

HAVING FOUND and developed suppliers capable of producing the materials in sufficient quantities, Western must concern itself with the quality of the products.

To insure the high quality required by the Bell System, specifications for most items are prepared by A. T. & T., Western Electric, or Bell Laboratories engineers, and these specifications may indicate not only the standards considered essential for each item but frequently even the method of manufacturing it. In the case of such items as lead sleeving, telephone poles, directory paper, and galvanized steel strand, for example, the quality must often be unusual. Standards of durability, weight, thickness and, in the case of paper, bursting or tearing strength as well as other qualifications must conform to precise tolerances in order to meet the heavy



From factories such as this, Western Electric obtains raw and finished plastic materials in dozens of forms for making telephone products

duty that will be imposed upon the product.

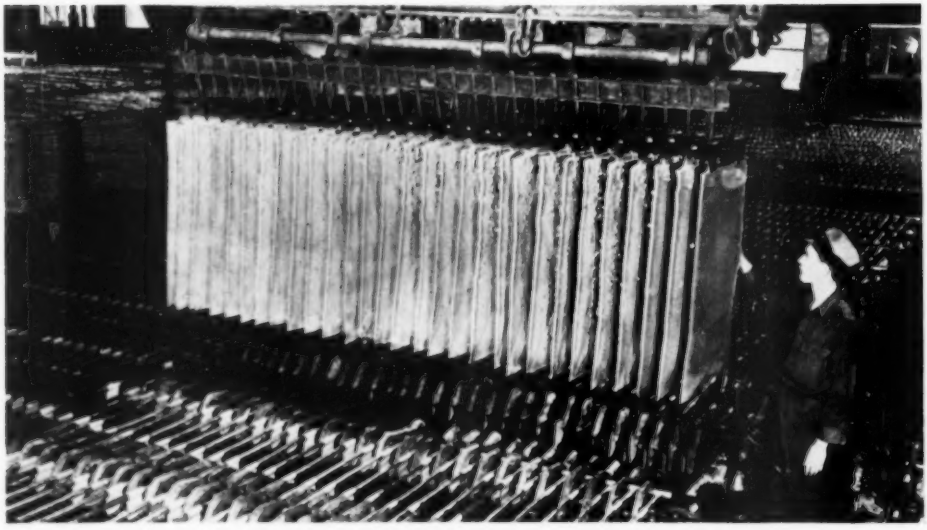
These standards are carefully insured by Western's Supplies Inspection organization, which has 165 inspectors throughout 35 states in over 350 towns and cities in the country inspecting items for Bell System use. Such items as timber products, pole line hardware, power plants, and over 4,000 others must pass the tests given them by Western's Telephone Division supplies inspection group before they are delivered to the Associated Companies.

Such exacting requirements are usually included as specifications in the contracts entered into between Western Electric and its suppliers.

Best Obtainable Price

PURCHASING for the Bell System at the lowest obtainable price, with due regard for service and quality, is of course a primary and ever present objective. To secure the lowest price, Western's purchasing men must be conversant with the fundamental factors that control cost movements. They must know the costs of raw materials, labor, and overhead necessary to produce the material and still allow the supplier a reasonable profit. They must also know the relationships between supply and demand. Favorable prices are then secured in the main by buying in large quantities, consummating purchases under favorable market conditions, and negotiating contracts which are fair to the supplier as well as to Western.

Perhaps a clearer picture of the operations involved in purchasing for the Bell System may be presented by following a typical purchasing operation from estimated requirements to delivery.



This is one step in the process of producing copper in a refinery. It is then cast into bars before being purchased by the Western Electric Company

Through conferences with the telephone companies, Western's Distributing Houses gather estimates for materials expected to be needed for a year ahead. In addition to the annual estimates, the telephone companies furnish Western with quarterly forecasts of anticipated requirements for certain major items. These forecasts, covering the immediate future, are reconciled by the Distributing Houses as necessary because of their stock conditions and past experience. They are then forwarded to the Program Planning Department of Western's Telephone Division, which uses them as a basis for determining the quantities of material currently required to be manufactured or purchased, long before any actual orders are received from telephone companies.

In an average year, Western's Purchasing people comb the Nation for the thousands of finished products essential to the Bell System's proper functioning. These include such items as thousands of motor vehicles, 124,000,000 pounds of telephone directory paper, 750,000 telephone poles, 1,125,000 crossarms, 35,000,000 feet of clay conduit, 31,000,000 pounds of steel line wire, 140,000,000 feet of steel strand, and 36,000,000 pounds of pole-line hardware—as well as abrasives, building materials, ceramics, chemicals, fuels, office supplies, paints and varnishes, textiles, tools, wearing apparel, leather products, furniture, and hospital, laboratory, and restaurant supplies.

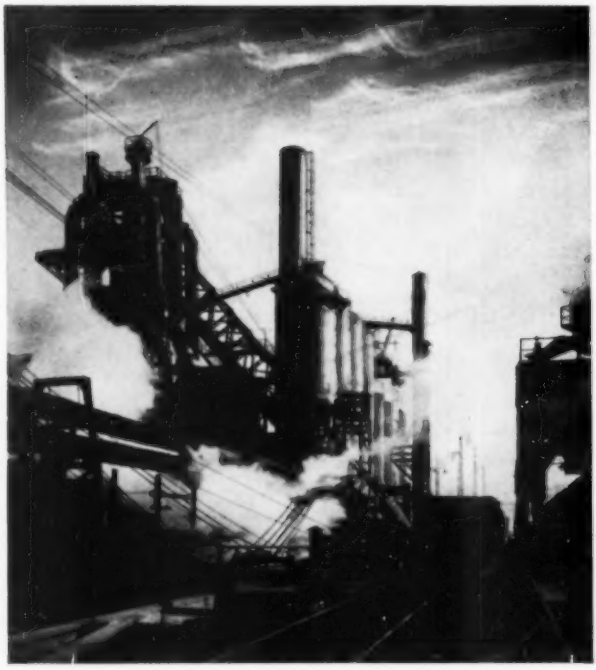
AFTER THESE FORECASTS have been carefully analyzed they are converted into "authorizations to purchase" issued to the Purchasing Division.

It is then the responsibility of the Purchasing Division to determine the best method for making these purchases and meeting these requirements. Shall it be a single contract for the entire quantity over a specified period? Shall the quantity be divided between two or more suppliers? Shall the contract period be long or short? Who shall be asked to bid and on what basis?

Take an item like inked ribbons. Western purchases well over $100,000 worth of inked ribbons a year for the Bell System. They are used for typewriters, tabulating machines, adding machines, etc. Excluding all insufficiently established or inexperienced companies, there are some 41 suppliers of inked ribbons having sufficient production capacity. Careful study of these suppliers by purchasing experts reduced the list to 10.

Now came the work of soliciting bids for the different varieties of inked ribbons to be covered by contracts, each with its individual price. Finally, when the bids came in, comparisons had to be made with the results of laboratory tests for each type of ribbons and also to see whether saving could be effected by dividing the business among different suppliers. The business was then split between two sources which were capable of meeting the requirements as to quality and at the most economical price.

Or take an item like floor wax. The Bell System's bill for floor wax is some $200,000 per year. But that is not all. More important than the original cost is the maintenance cost and the possible damage to linoleum floors, if the wax is inferior. The cost of linoleum in use in the Bell



Steel from factories like this enters into the manufacture of various items of telephone equipment

System exceeds $10,000,000. A. T. & T. has figures to show that the maintenance cost of linoleum is some $3,500,000 per year. The figures also show that improvements in wax developed by Bell System engineers over a period of 15 years and now specified in suppliers' contracts have saved the System some $1,000,000 per year in reduced maintenance costs.

It can thus be seen that the original cost was not the only or the most important factor in this purchase but that, as in many other similar instances, years of coöperative effort between the supply specialists of A. T. & T., Western Electric's purchasing specialists, and the suppliers were required to evolve the present standards and produce current results.

Finally, let us take an item designed especially for Bell System use, requiring special tools and techniques. Such an item would be the truck bodies for vehicles.

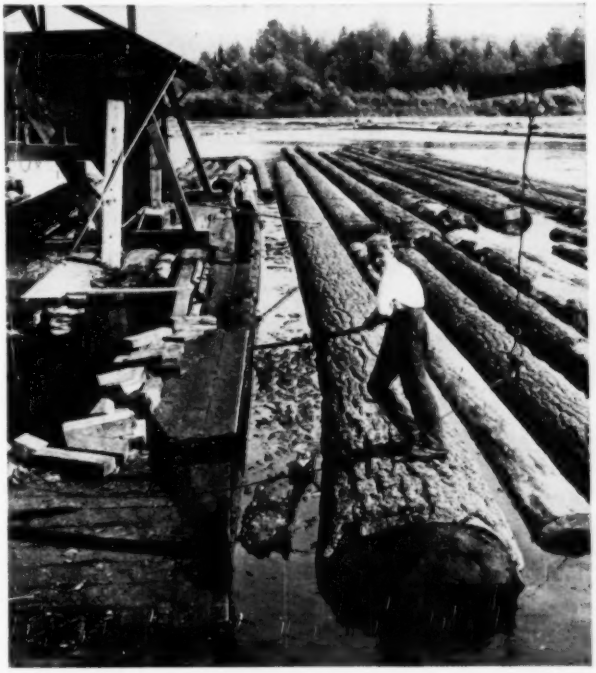
There are a number of important different body designs for Bell System trucks. These range from the small installation truck, with its specially designed body with drawers and compartments for installers' equipment mounted on a half-ton chassis, to the big construction trucks mounted on 2- to 5-ton chassis which are equipped to pull line wire, dig pole holes, and perform other operations. These truck bodies are not easy to manufacture, and suppliers who can produce them in strict accordance with A. T. & T. specifications, and at the same time produce them economically, are difficult to find. This is particularly so when the demand is heavy and old-line suppliers have more orders than they can handle, with the result that new suppliers must be developed. To secure such bodies with the present steel shortage, Western entered into agreements with three suppliers to produce aluminum bodies.

These examples illustrate something of the complexity of purchasing for a delicately balanced and highly intricate nation-wide telephone system.

The Purchasing Organization

THE 600 people of the Purchasing Division who perform this major task are organized into four groups.

They are: (1) the group responsible for the procurement of raw materials and supplies used in Western's manufacturing plants, such as copper, lead, steel, brass, lumber, machinery, apparatus, tools and equipment; (2) the group responsible for Bell System outside plant materials, including such items as telephone poles, crossarms, insulators, clay conduit, motor vehicles, and tools; (3) the group responsible for the procurement of Bell System inside plant material, covering such items as paper, printed matter, office and janitors' supplies; and (4) the group responsible for recommendation of procedures for coördinating purchasing activities, supervision of clerical methods, and studies of markets and material costs.



These logs are on the way to become telephone poles. Western purchased more than 750,000 poles in 1948

Reporting to each purchasing agent within each group are the assistant purchasing agents responsible for the work of the buyers under their supervision. Each assistant purchasing agent, with his group of buyers, is experienced in handling a particular group of related or analogous products, such as automotive equipment, which includes items like trucks, passenger cars, gasoline, batteries, lubricants, tires and tubes; or building equipment, which includes such items as fans, paints, and commercial refrigerating equipment; or the ceramics group, with such items as clay conduit, insulators, porcelain tubes, and pipe.

But efficient purchasing requires that the men not only know their materials, suppliers, and markets, but that they understand and be familiar with local markets also. And for that they must be on the spot—at the Works, at the 28 Distributing Houses, and in the field.

For this reason, purchasing units are stationed at each of Western's manufacturing plants to buy for their respective locations, while local buyers are also maintained at the Distrib-

uting Houses. Each local buyer is actually a member of the Distributing House organization at which he is stationed, and his duties are to assist in the proper placement of orders on contract suppliers, to purchase miscellaneous non-contract material, and to represent the Purchasing Division in the field by giving information on local conditions and potential sources of supply.

The purchasing activities of all distributing houses except those on the Pacific Coast are coördinated by the headquarters supervisor of Distributing House buying. In addition, there is a Pacific Coast purchasing agent who acts as a general representative of the Purchasing Division and assists the Distributing House managers in that area with their local buying problems. He also negotiates certain contracts for such materials as are required from coast suppliers and coördinates his activities through a headquarters purchasing agent.

These purchasing men know their markets, know their materials, know their suppliers. They understand their suppliers' problems and by their knowledge, ingenuity, and skill have through war and emergencies not only uncovered many reliable and valuable sources of materials and supplies for the System but also helped Western's suppliers meet the Bell System's requirements.

Thus, year after year Western's purchasing job means keeping open hundreds of raw material and maintenance supply lines to the System itself. From thousands of cities and towns, from 27,000 suppliers—a cross section of American industry—Western's Purchasing men continue to gather the tens of thousands of items needed in the maintenance and operation of the Bell System.

Index Now Available

AN INDEX to Volume XXVII (1948) of the BELL TELEPHONE MAGAZINE may be obtained without charge upon request to the Information Department of the American Telephone and Telegraph Co., 195 Broadway, New York 7, N. Y.

Twenty-five Years Ago in the

BELL TELEPHONE QUARTERLY

Items from Volume III, Number 2, April 1924

The Meaning of Research To the Telephone Investor

IN FORECASTING problems and supplying their answers, the development and research staff functions as a reconnaissance agency which thoroughly investigates the future, keeping the operating and service branches of the telephone army which are to follow supplied with exact information as to the technical and industrial terrain over which they will pass. In this way the objectives of the future can be planned and attained with much greater facility and economy than would otherwise be possible.

Research helps to give not only better service at a reduced cost to those who use the telephone but also increases the variety of services offered. It is important, therefore, not only to the executives of the System but to the telephone user because it assures him the best service our knowledge of natural laws makes possible. It furthermore safeguards the investor and assures him that those spending his money have the broadest view of what science holds in store and that, as new discoveries are made, they will be woven into the plant, which his money has built, with the maximum of efficiency and economy and in such a way as to yield the best returns.

There are several methods of depicting a corporation's business and financial standing. One of these, and perhaps the one most usually appealed to, is the balance sheet. But the balance sheet tells of the past while research forecasts the future; and the Bell System, while proud of its balance sheet, faces the problems and opportunities of the future with the largest research and development staff in the world, with a successful record of achievement behind it.

—From an article by R. W. King and G. C. Southworth.

Southern Transcontinental Line

THE NEW Southern Transcontinental Line—a through route from Denver to Los Angeles by way of El Paso, Tucson, and Phoenix—was placed in service on the afternoon of December 22, 1923 and a Chicago-Los Angeles circuit connected up just in time to carry its share of the heavy holiday traffic to and from the southwestern section of the United States.

This circuit . . . 2937 miles in length, is the longest through circuit in the world. It is more than 500 miles longer than the Chicago-San Francisco circuit, more than 1200 miles longer than the New York-Havana circuit, and more than 1500 miles longer than the New York-New Orleans circuit. The longest known through circuits in any country of Europe, from Berlin to Essen, 342 miles, and from London to Glasgow, 418 miles, do not compare with it in length.

The engineering and construction of these long circuits was a noteworthy achievement. For a greater part of the circuit the wires were run on existing pole lines, but two long stretches of entirely new poles were required, one covering seventy-five miles between Denver and Colorado Springs and the second, about ninety miles in length, between San Antonio and Rincon.

Among the most serious of the problems

encountered, from the construction standpoint, was the difficulty of transporting the large amount of materials required. The varied topographical and climatic conditions met with in the course of the work may be understood when it is remembered that at one point—Raton Pass, near the Colorado-New Mexico border—the altitude is 7,600 feet; while at another—near Salton, just over the California boundary from Arizona—the line dips into a depression 200 feet below sea level. In building the line, the telephone construction trucks had to make their way over mountain roads, desert sands, lava beds, cactus country and arid lands reclaimed by irrigation.

—From Notes on Recent Occurrences.

Who's Who & What's What

(*Continued from page 3*)

moved to the group handling toll service results and central office training; and in 1945 he became Traffic Results Engineer. In June 1949 he was transferred to the Commercial division as Sales and Servicing Engineer.

JOINING the Bell Telephone Company of Pennsylvania at Pittsburgh in 1923, ARTHUR F. LEET transferred two years later to the Commercial Results section of the O. & E. Department of A. T. & T. There his work has included the development of coin telephone collection procedures, analysis of business office results, and estimates of Commercial expenses. At present he is engaged in the improvement of bill forms and billing procedures, of business office methods in connection with customers' payments, and in the safeguarding of collections.

SEVEN YEARS as associate editor of *Collier's Magazine* are reflected in GEORGE DE MARE's organization of the article on the Western Electric Company as purchasing agent for the Bell System and his exposition of how the Company executes that complex function. Leaving Collier's in 1943, he joined the Public Relations division of Western Electric, and is at present managing editor of *WE*, Western Electric's new quarterly publication.

WITH the Pacific Telephone and Telegraph Company since 1924, WHEELER F. SCHALL has spent the ensuing quarter century in publicity, information, and advertising activities in the Information Department—except for four years in the business offices of the Commercial Department. He is now staff supervisor in the Company's Northern California and Nevada Area information office, and writes of the passing of San Francisco's most famous central office with all the familiarity of an "Old China Hand."

LAST WINTER'S STORMS are long since past, but their severity was so extreme as to take JUDSON S. BRADLEY on a brief trip into Nebraska, Missouri, Oklahoma, and Texas to observe their effect upon telephone service. In Omaha he was able to learn from Gen. Lewis A. Pick, director of "Operation Snowbound," and from Mr. Donald Stout, assistant manager of the Red Cross Mid-western area, something of the part which the telephone played in their widespread rescue operations. In the sleet area to the southward, he had opportunity to observe the progress of service restoration and to talk not only with the men from many states who were rebuilding the lines but with others who were directing operations. Joining the Information Department of the Southern New England Telephone Company in 1925, after several years of editorial and publishing experience, he transferred five years later to the corresponding department of the A. T. & T., where he has been for the past six years editor of this MAGAZINE.

Only Chinese Telephone Central Office outside of China Yields to Progress as Switchboard Is Removed and Unique Building Becomes Business Office

San Francisco's Chinatown "Goes Dial"

Wheeler F. Schall

SAN FRANCISCO's picturesque Chinatown telephone central office, established in 1894, and the only Chinese telephone office outside of China itself, has "gone dial."

At an early hour on January 22, 1949, the final cutover of all telephones in Chinatown to dial operation was accomplished by the Pacific Telephone and Telegraph Company, without incident or public ceremony. The telephones of 700 subscribers had previously been changed to dial service in November 1948. The second cutover, involving an additional 1,400 subscribers, completed the conversion project, and old CHina 5 officially became YUkon 2.

While to many San Franciscans the change marked the end of an interesting chapter in local history, Chinatown's 12,000 inhabitants looked on the transition as another milestone in the Americanization of their colony. Despite their deep regard for tradition, San Francisco's Chinese are forward-looking citizens, keenly interested in civic progress and advancement of Western culture.

Switchboards are being removed from the pagoda-roofed telephone building at 743 Washington Street, and its ornate interior will be converted to business-office purposes. Equipment for Chinatown's new dial service is housed in the company's main operating building on nearby Bush Street. The Chinese operators have been offered work opportunities in other central offices.

THE HISTORY of the China exchange requires a flashback to the beginnings of Chinatown, on a foggy morning in February 1849, when the sailing vessel *Eagle*, back from a cruise in Far Eastern waters, dropped anchor in San Francisco Bay at the foot of Clay Street. The *Eagle* carried in her hold a cargo of tea and silk—and three Chinese: two men

and a woman. This trio had heard in Canton of the discovery of gold in Gum Shan, or Gold Mountain, as the Chinese called America. They had come to San Francisco to acquire a fortune of a few hundred dollars each. After that they would return to China to live out their lives in comfort, die in state, and be buried among their ancestors with ceremony befitting Chinese of high social rank.

These three persons were the first Chinese immigrants to set foot in San Francisco—or in California, for that matter. Strangers in a strange land, forlorn and disconsolate, they trudged off the wharf under the weight of their bundled possessions and slowly climbed the muddy trail which led to the Plaza. Here they attracted a lot of attention with their oriental dress and "pig-tails."

As trading vessels carried the news of the gold rush around the world, it was not long before the "cousins" of these Chinese pioneers began to arrive in increasing numbers. Incoming ships brought at first a few, then a score, and by the end of 1850 they were arriving in droves. California needed the manpower, and the Chinese were not only welcomed but were urged to induce their countrymen to come. By 1852, the Chinese male population of California was estimated at 22,000.

A majority of these immigrants went directly to the gold fields. There they were not so kindly received as in San Francisco. They worked long hours, found profit in

The Chinatown central office in San Francisco which was removed from traffic service early this year. The golden dragons sprawled against a rose background near the roof, and the elaborate gilded wood carvings, have been retained as the building is converted to business-office use. At the desk in the center of the picture sits Loo Yee Kern, Chinatown manager. Behind him to his left are R. J. Wood, traffic chief, and Florence Chow, then chief operator

The operating room of the Chinatown central office which was destroyed in the fire of 1906. In the foreground stands Loo Kum Shee, first manager and father of Loo Yee Kern

"diggings" which the white miners had abandoned as worthless, and lived frugally, hiding most of their earnings away for the great day of return to China.

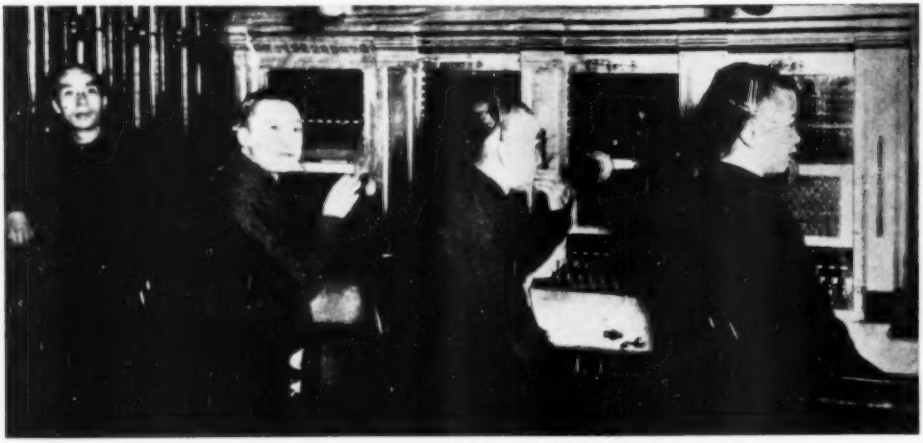
In the meantime, a minority of Chinese, mainly merchants and dealers in coolie labor, remained in San Francisco. These were the founders of the settlement in the heart of the city which eventually became known as "Chinatown."

"*Invisible Spirits*"

THE CHINESE were quick to adopt American machines and inventions —except one. The exception to the rule was located on Bush Street near the southern end of Chinatown, in a telephone office. There, by the early 'eighties, one could go and talk to invisible spirits of persons far away—even as far as Sacramento. Now, the Chinese were not afraid of most machines, because they could see how they worked. But talking to a little black box on the wall and having it talk back, sometimes in a foreign tongue, was surely the work of evil spirits, and they would have none of it.

However, one by one, the bolder merchants and labor contractors ventured to use the public telephone in the Bush Street telephone office. With no bad luck befalling them, they repeated the experience until superstition gradually disappeared and the telephone became a factor in the daily business activities of Chinatown's business men. It was several years, however, before it was accepted in the Chinese home for social use.

Most of the early Chinese telephone business was conducted over long distance lines. Practically all of the calls were placed from points outside of San Francisco by farmers having produce to sell, and by persons seeking Chinese laborers. These calls would come into the Bush Street office of the telephone com-



Switchboard and operators of the Chinatown central office in 1901. Chinese men continued to serve as operators until 1904–05

pany with the request to have a particular Chinese merchant or labor contractor in Chinatown called to the telephone.

The company maintained a corps of messenger boys to hunt up Chinese wanted on the telephone. Finding the right person in a settlement of some 20,000 was no easy chore, but the boys gradually learned to know their customers' names and favorite haunts. If the person wanted was not found in his usual place of business, the messenger would track him down and send him to the Bush Street office to answer his waiting call.

A Chinese customer seldom liked to go to the telephone office alone. When summoned for a call, he would round up a coterie of his countrymen to go along—placing his faith in the safety of numbers, even against the designs of evil spirits. Thus they would come in such numbers, many perhaps out of curiosity, that before long the office became a sort of community house.

Eventually, a public telephone was installed at a more convenient location, in the office of the Chinese newspaper *Mun Kee*. This was sometime prior to 1891—the exact date is not known. Thereafter, all Chinese telephone business was transacted there.

As the Chinese became more familiar with the telephone, they realized its value in business and began to ask for service in their stores and offices. In 1894, a small switchboard was installed in a building at the corner of Washington and Dupont streets. (Dupont was later renamed Grant Avenue.) This exchange served 37 telephones in Chinatown, but was not connected to the San Francisco system.

The Chinese became increasingly enthusiastic about telephone service, and applications mounted steadily. Soon it became necessary to provide a new switchboard and expand central-office facilities. The new installation was placed in service in 1898, with 200 business stations connected.

This was the first Chinatown central office to be connected with the Pacific Telephone and Telegraph Company system serving the rest of San Francisco, and provided exclusively for the use of the Chinese. A Chinese manager was placed in charge. He solicited subscribers, kept accounts, collected bills, and hired and paid his own operators. Subscribers talked exclusively in Chinese. This custom gave San Francisco the unique distinction of having the only telephone office in the world conducted in an alien tongue.

The First Manager

CHINATOWN'S first telephone manager was Loo Kum Shu, a native Californian, born near Marysville in 1864. His grandfather was among the first Chinese immigrants to land in California, arriving soon after gold was discovered by Marshall at Sutter's Mill. Loo Kum Shu's father was employed by the Pacific Mail Steamship Company until, on an ill-fated voyage, he was lost at sea.

Loo Kum Shu, then eight years old, was placed in the home of Mrs. Florence Bokee, an American missionary, who taught him to speak English and raised him as her own son. He received his elementary education in the Chinese Mission School, at Jackson and Dupont streets, where Mrs. Bokee was a teacher. He continued his schooling at the University of California, where he was graduated.

Loo Kum Shu managed the Chinatown telephone exchange for 28 years. The office early became one of the show places of San Francisco, and welcomed thousands of visitors from all parts of the world. A genial host, Loo Kum Shu made many friends, and became one of the best-known, best-liked citizens of the community. He died December 8, 1926, at the age of 62. His funeral was one of the largest ever held in

This group of Chinatown operators represents a total of 147 years of service

An operator at the Chinatown central office switchboard

Chinatown. The service, a quaint, age-old ceremony, was held in the open air in historic Portsmouth Square.

Offices Old and New

THE CHINATOWN telephone office remained at the corner of Washington and Dupont streets until 1902. In that year the company purchased a building at 743 Washington Street, and remodeled the interior especially to accommodate an exchange which would be unique in every respect and worthy to become a showplace of San Francisco.

The switchboard was ebony-finished, and above it two golden dragons sprawled against a rose background. The ceiling was softly tinted and richly embellished with gilded wood carvings of intricate design and exquisite workmanship. Walls were done in black lacquer trimmed with red and gold. By night the office was illuminated with huge Chinese lanterns, the most elaborate to be found in all Chinatown. By day it drowsed in the soft mellow light that filtered through quaint oyster-shell windows. And from the depths of a richly tapestried shrine near the entrance, a Chinese god kept watch over the affairs of the little office.

This ornate exchange was destroyed in the great San Francisco fire of 1906. Nothing was saved but a part of the underground plant. The ruins had not yet ceased to smoulder when plans were under way for a new telephone system for Chinatown, complete with a central office, larger and better than the one destroyed.

The company erected its new Chinese central-office building on the site of the one razed by the fire, and installed an eight-position switchboard of the latest design. The new office was placed in service in August 1909, with approximately 800 telephones connected. This office served Chinatown continuously under manual operation until the system was converted to dial.

The new China office was constructed along true oriental lines to harmonize with its surroundings, although the interior was not as ornate

as that of its predecessor. It was unique, nevertheless, and remained a showplace of San Francisco, welcoming thousands of visitors every year.

A service representative accepts a customer's payment

Chinese Operators

MOST OF THE 25 Chinese operators who worked in the central office followed telephone work as a family tradition. Employment there gave a mark of standing in the community, and, as such, was passed from parent to child. In fact, several of the operators were daughters and granddaughters of men operators who handled calls in the old China exchange of 50 years ago. Mothers who operated the switchboard saw to it that their daughters were properly trained and educated for the work. Each was made an accomplished linguist, who spoke not only impeccable English but also five Cantonese dialects: the Som Yup, Heong San, Gow Gong, Say Yup, and Aw Duck.

Calls to China telephone subscribers were made in the usual way from San Francisco telephones. However, some of the old-time subscribers persisted in asking to speak to Lin Yung or Ah Wong without giving the telephone number. Consequently, a new operator spent a part of her first three weeks' training studying the names, addresses, and telephone numbers of some 2500 subscribers listed in the China telephone directory. Within a few weeks the new operator was usually able to recognize the party wanted, whether asked for in English or in Chinese. Little wonder, with service like that, the practice of calling by name instead of telephone number continued to the last!

Choy Chan was one of the first women operators to replace the men who originally staffed China office. As a girl, she was a messenger whose duty it was to summon Chinese customers to the telephone to answer long distance calls. When Choy Chan's father, Chan Yung Lai, one of the first men operators, retired, she took his place at the switchboard. As late as 1901, in the days of the Manchu Dynasty, Chan wore a queue which he wound in a coil

around his head to keep it from tangling with the switchboard keys. With the creation of the Manchurian Republic, queues of the Westernized Chinese were doffed. Today, the granddaughters of Chang Yung Lai's contemporaries sit at their switchboards wearing up-to-date dress and hair styles like other American girls.

Chinatown's unique telephone directory might be called America's only "hand-painted" directory, since all names, addresses, and numbers were lettered by hand in Chinese characters. The China directory was set up by street addresses rather than alphabetically, because the Chinese language has no A-Z alphabet as we know it. Approximately 2800 of these books, which were exclusively for Chinatown users, were delivered. For other San Francisco telephone users, the Chinese names and numbers are printed in English in the regular city telephone directory.

The first Chinatown central office switchboard of the Pacific Telephone and Telegraph Company, which handled 50 lines. This picture, taken about 1895, shows Suey Sing Ching, operator; Chan Yung Lai, standing; and the latter's son, Albert Bew Chan, ready to summon a customer to receive a long distance call

The lettering of the Chinese directory was done by a young Chinese, and required about two weeks to complete. The finished pages were then made into engravings ready for the regular American printing process. The expert letterer used a thick sepia ink called "mock" taken from the ink bag of a cuttlefish caught in the ocean near Monterey. Purchased in dried pieces and ground in a mortar, the ink was mixed with water and poured over a sponge which served as an inkwell. The letterer used a small brush called "put."

Telephoning in Chinatown

TELEPHONE HABITS of the Chinese are quite different from those of other San Franciscans, since they keep their shops open until late at night and sleep most of the morning. The peak calling hour of the day comes from 3 to 4 P.M., when numerous social conversations are carried on. A secondary peak calling hour is from 11 A.M. to noon, when Chinatown's late risers begin to stir and start the day's business. These calling habits make an interesting contrast with the peak hours for San Franciscans in general, which are from 9 to 11 A.M., 4 to 5 P.M., and 6 to 8 P.M.

Life in Chinatown is full of activity. Chinese operas occupy the attention of many from 7 to 12 every

evening. Immediately after the opera, it is the custom to return home and telephone for food and refreshments. Chinese telephone users frequently retire at midnight when, sitting up in bed, they call up friends for lengthy conversations. China exchange operators were not surprised to find calls continuing from midnight until four or five o'clock in the morning. Chinese women, like their American sisters, often market by telephone, and excel in making innumerable calls to bargain for the lowest possible prices. This telephone bargaining, of course, makes for a high number of calls per day.

Tong wars used to make life interesting for the telephone operators in the old days. When such a conflict arose, every member of the staff was subject to immediate call to duty. The echo of the first shot had scarcely died before every position on the switchboard was filled. This would be none too soon, for the telephone calling rate soon shot up fantastically as the Chinatown populace rushed to warn relatives. As tong wars were always scheduled to start at the same time in all cities, there would be a deluge of long distance calls to Chinatowns through the United States. These, and the local calls, far exceeded the capacity of the boards and the ordinary daily calling rate of 10,000. Delays piled up while anxious relatives pleaded and the operators, queues bobbing, worked at top speed. Quite a contrast to the peaceful Chinatown of today.

Quong Lee, a Chinese merchant in the heart of the oriental colony, was among the first 150 subscribers on the Pacific Coast, and the first Chinese telephone subscriber in the world. His name appears in the initial San Francisco telephone directory dated June 1, 1878, and his grandson is still a subscriber with the same name in the same location.

Exterior of the former China 5 central office in San Francisco

Loo Yee Kern, son of the original manager Loo Kum Shu, is the present manager of the China telephone exchange. Kern took his first telephone job at the age of eight, when he and his brother distributed Chinese telephone directories in a little pushcart which they wheeled all over Chinatown's 14 blocks. He learned to operate the switchboard at the age of 13. Florence Chow, his sister, was the chief operator.

And even though the telephone traffic of the Chinese no longer has its crossroads at 743 Washington Street, the little pagoda-roofed "doll house" still beckons to visitors, proud of its part in San Francisco's colorful Chinatown.

Freakish Weather, Bringing Blizzards in the North and Sleet further South, Tests the Bell System's Telephone Plant and Its Recuperative Powers

The Winter's Toll Was Heavy From Texas to the Dakotas

Judson S. Bradley

NATURE laid a heavy hand last winter on much of our country's central West, from the Canadian border almost to the Gulf. Extending from the Rocky Mountains across the high plains to the middle of Nebraska, the blizzards were the severest within the memory of man. Further south, a series of sleet storms cut a wide swath across Texas, Oklahoma, Arkansas, Kansas and Missouri to create one of the major service disasters of Bell System history. And while that is by no means a roster of all the weather that occurred—as Southern California, for example, can testify—it was upon the territories of the Northwestern, the Mountain States, and the Southwestern Bell Telephone Companies that the major and most extensive storms fell.

The winter's storms are here spoken of collectively, which may be misleading. For not only were they different in calendar and geography, but they were different in kind and hence in effect. And it is a bit of a paradox that in the north, where day after day of dry snow driven by bitter winds brought damage, suffering, and death in a vast area, telephone plant stood up well and telephone service was a carrier of important tidings and a bringer of needed help; while further to the south the ice and sleet caused nothing much more serious than inconvenience to the people in the affected territory and yet laid low telephone plant which it is costing about $10,000,000 to restore.

Spring follows even the toughest winter, and all repairs were made and service was fully restored long since—thanks to the Bell System's nation-wide resources and the flexibility of its organization. But a good many people are going to think and talk for years to come of the Blizzard of '49 as old-timers do of

Traffic on U. S. Highway 30 was completely blocked, but traffic over the voice highways beside the road flowed freely

the Blizzard of '88; and others further to the south will for years to come make only half-jocular references to the Ice Age of 1949.

THE GRAVITY of the situation in the northern Plains States, and the heroic measures required to meet it, attracted wide attention when, at the

This picture was taken from in front of the Northwestern Bell's business office on the main street in Chadron, Neb.

There is no hill here. These two Northwestern Bell traffic people are standing in front of a snowdrift on level ground

end of January, General Lewis A. Pick, Corps of Engineers, U. S. Army, was assigned to take charge of "Operations Snowbound"—a rescue operation on the grand scale in territory comprising 177,000 square miles. General Pick, then Missouri River division engineer, was builder of the Ledo Road from India into China during World War II, and is now Chief of the Corps, with headquarters in Washington.

But the storms had a long headstart.

The first one had hit the territory of the Northwestern Bell toward the end of last November, and was followed by others early in December and after Christmas. They did more than a million dollars of damage to telephone plant; but they were "normal" winter occurrences and could be—and were—coped with.

January brought the real trouble. Swept in on mile-a-minute gales, snow swirled and piled up and swirled again over the countryside almost continuously for a month. Record-keepers identify the storms of January 3–6 and January 22–23 and January 27–28; but the wind seldom stopped its mad dance with whirling snow for partner, and the plains for hundreds of miles were overwhelmed. Most of January was, in effect, one continuous blizzard.

The consequences were disastrous. In parts of Nebraska, North and South Dakota, Wyoming, and Colo-

To clear a case of trouble here, this combinationman had to dig down to the wires on top of 20-foot poles

rado, mobility all but ceased. Highways, roads, farm lanes were impassable. People in cars and trucks fled them and found shelter—or missed it and perished. Trains were blocked for days on end. Cattle froze or starved by the thousands. Not only farm homes and ranches were isolated and imperiled, but whole communities. Often a thread of wire—a telephone line—was the only source of comfort and reassurance, the only link with aid or rescue.

These men of the Mountain States Telephone and Telegraph Company, and others not pictured, used their "snow buggy" to save several lives in the Cheyenne, Wyo., area

By and large, the telephone held up against wind and snow. "The telephone was our life line," said a Nebraska rancher.

The telephone served in two major ways. In hundreds upon hundreds of individual instances, it brought help—food or medicine or evacuation or just a snow-ploughing bulldozer—to people whom winter had immobilized. And—the other half of the picture—the telephone directed not only the responses to such appeals but the large-scale operations of local and state authorities, the Army, the Red Cross.

The scene is large and the details are many. There is no full record, for example, of the number of babies who were born in hospitals because the telephone summoned a weasel (light tractor-mounted Army truck) or ski-mounted plane to get the mother there ahead of the stork; nor of the babies who were born "by telephone" so to speak—with the guidance and encouragement of the doctor's voice coming over the wire—be-

Stretcher case. Men of the Fifth Army, the Red Cross, and the State Patrol coöperated to bring this patient to safety with an Army "weasel"

cause no vehicle could get through. Three neighboring towns, all snowbound, had no doctor, so the Red Cross stationed one at a point central to all three, where a telephone summons could bring him air-borne to a patient's bedside. Just about every individual rescue—and there were thousands—whether by Red Cross, the Army, a community group, or a telephone man in a heavy construction truck, came as the consequence of a telephone call.

The primary mission of General Pick's "Operation Snowbound" was to open roads in an area bigger than all New England and a couple of other states too. His forces unblocked more than 115,000 miles of roads, and thereby gave many families access to food, fuel, cattle feed, and other necessities. His headquarters were established in Omaha, and two main field offices were opened in Nebraska, two in South Dakota, and one in Wyoming. These were supplemented by more than 30 smaller offices throughout the territory. Thousands of men and hundreds of pieces of heavy equipment were located—most of them by telephone—and dispatched with all possible speed, and the telephone played its vital part in bringing reports and conveying directives throughout the vast area.

Said General Pick, "Operation Snowbound relied constantly upon the telephone and other speedy means of communication. Without the telephone and the fine coöperation of telephone people and switchboard operators, our task would have been much less speedily accomplished and relief longer delayed."

"Operation Snowbound": the general Headquarters office in Omaha

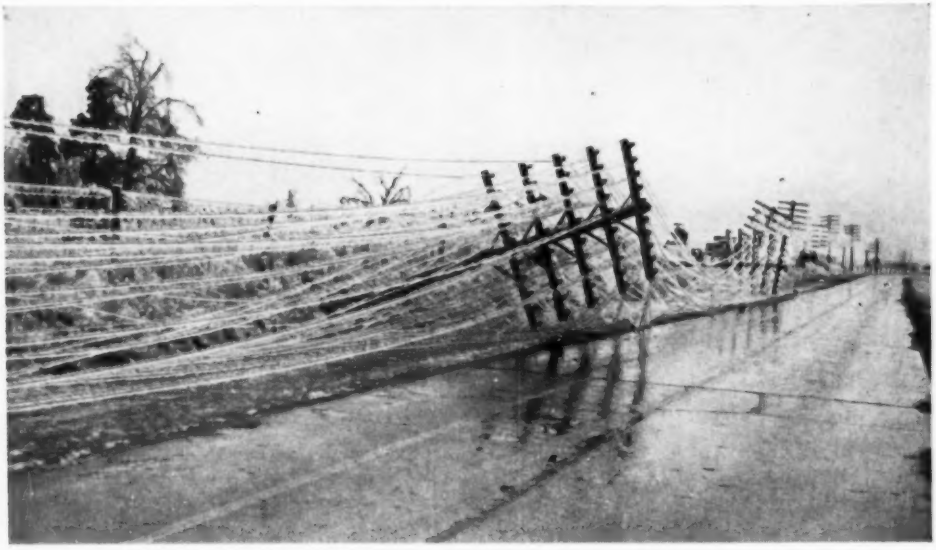
Flying Doctor. A telephone call to the Red Cross brought him to a patient's bedside by helicopter or by plane equipped with skis

THE PRIMARY MISSION of the Red Cross took up where the Army left off. It was to meet all basic human needs of an emergency nature: food, fuel, medicine, evacuation of the elderly and ill and injured. So close was the coördination between the two that Mr. Donald Stout, Assistant Manager of the Red Cross Mid-western area, set up his headquarters in the same Omaha building with General Pick and his staff, and consultation was frequent and effective.

While the scope of the disaster called for the assistance of national Red Cross representatives and national funds, most of the work was performed by Red Cross local chapter volunteers. Canteens fed blockaded travelers, 348 air force and private planes flew innumerable missions of mercy, 644 persons were evacuated by air and others by various types of land vehicles.

The telephone, said Mr. Stout, "was invaluable in practically everything we did. By telephone we were able to dispatch directives quickly, to route our planes and personnel, order relief supplies, make surveys. . . ."

Many a telephone operator, having reached the central office against a snowy blast, could not venture home again for days, and stayed either at a nearby hotel or on a cot in the telephone building until the fury of the storm abated. In some places they could get out for meals, elsewhere food was sent in, and in still other places where the traffic load was heavy, snowbound Plant and Commercial men cooked meals in the Traffic kitchenettes and even did "KP" afterward.



No traffic moves on this Missouri highway because the glistening ice on its surface is three inches thick and quite unnavigable

Operation Snowbound

The Score

115,138	miles of road cleared in four states.
243,780	marooned people reached by road clearance operations.
4,010,000	head of livestock provided with access to feed.
1,559	reconnaissance trips made by air and ground vehicles.
14,565	Red Cross services provided by air and ground vehicles.
876	ill and aged persons evacuated, two-thirds by air.
11,130	families aided through Red Cross services.
17,419	meals served in Red Cross canteens.

Telephone men took on extra duty in getting operators to and from work in company cars and heavy trucks; and in Colorado and Wyoming, men of the Mountain States Company, which has specially equipped snowmobiles for traveling off the roads, responded to urgent summons and saved the lives of several men, women and children.

One operator spoke for all these blizzard-beleaguered telephone people when, after battling her way to the central office, she said, "Sure it was tough getting down here. But if there is any romance in the telephone business, it is in times like these when everyone is trying to make a call of some kind and you never know how much that particular conversation will mean to the customer."

What the sleet did to this Dallas-St. Louis line near the Texas-Oklahoma border is typical of the destruction over a wide area

FARTHER to the south, Kansas and Oklahoma had likewise been plagued by November storms. They were just curtain-raisers, however, for what the New Year brought.

What it brought was storms in series: wind, rain, floods, sleet—mostly sleet. For the last three weeks of January, a good part of the territory of the Southwestern Bell Telephone Company was subject to a succession of sleet storms which added up to the costliest and most extensive catastrophe in that company's experience. From the western border of Texas in a wide band to the north- and eastward for 1500 miles, clear to the upper edge of Missouri, and including a large share of Oklahoma and corners of Kansas and Arkansas, trees went down, poles went down, wires went down.

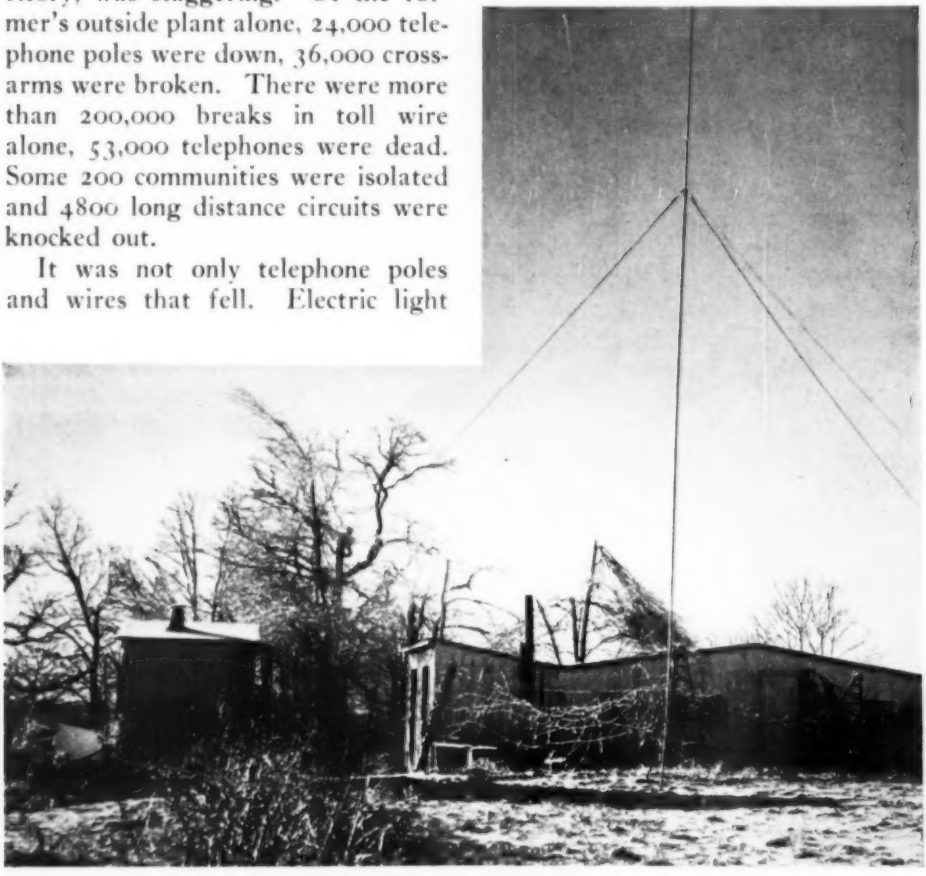
Before the sleet of the January 10 assault had melted, forces were rallied to the pressing task of restoration. But it was a Sisyphean undertaking; for a crew which rebuilt and

Some icicles were as much as six inches long

restrung an open-wire pole line and left it firm and secure might be called back a few days later to pick it up out of the road where it had been flung by a second crushing load of ice. In some places such heartbreaking occurrence actually happened three times in a row before the storms left off bedeviling that part of the world.

By that time, the score for Southwestern Bell, and for the Long Lines Department of A. T. & T., which of course operates through the same territory, was staggering. Of the former's outside plant alone, 24,000 telephone poles were down, 36,000 crossarms were broken. There were more than 200,000 breaks in toll wire alone, 53,000 telephones were dead. Some 200 communities were isolated and 4800 long distance circuits were knocked out.

It was not only telephone poles and wires that fell. Electric light and power lines suffered too. The stoppage of light and heat and power brought floods of emergency telephone calls, yet many could not be completed over broken wires. Emergency generators were pressed into use, operators in scores of central offices worked by candlelight, and in some places they had to resort to hand ringers. More than one chief operator looks back on that combination of heavy calling and limited facilities as the most trying period of her career.



This chicken house provided shelter for one half of a pair of portable radio telephone units which gave temporary service between Eldon and Jefferson City, Mo.

The great needs were, of course, two: materials—supplies and equipment—to replace what was destroyed or useless; and men, to build the materials back into the plant and restore the service. Both were forthcoming—fast.

All Southwestern Bell's own crews were summoned and assigned to storm repair, naturally. But because the Bell System operates as just one unit when exigencies require, help came from neighboring Associated Companies not so storm-stricken—Illinois Bell, Southern Bell, Mountain States Tel. & Tel. And Long Lines sent in crews from 18 states. To see telephone trucks from Florida and Colorado and Pennsylvania and Michigan and many another state all concentrated on the one task, and to know that the men can work efficiently, no matter where their home base, because methods and materials are the same everywhere, is to get some concept of what the Bell System is and what its single aim means for the nation's telephone service.

Men, trucks, and supplies combine to bring about this swift restoration near Durant, Okla.

So the outside crews came a-running. They were most welcome, and preparations had been made to welcome them. For men need places to sleep and food to eat; and when many men suddenly descend upon sparsely settled areas, with communities small and perhaps many miles apart, they pose a problem to which an answer must be found with no delay.

Southwestern Bell plant men found many answers. They practically took over such hotels and motor courts as met the need. They obtained rooms in private homes, they found temporary accommodations in Veterans' Hospital, National Guard Armory, school dormitory, other unusual quarters. Many a hotel chef got up earlier, many a dining-room proprietor called in more waitresses, many a lunch-room operator doubled and tripled his orders for supplies to care for the appetite of the new-

Temporary restoration near Abilene, Tex.: a broken pole reset to get the toll lead back into service

comers. But all were housed and fed, so that they could and did go at their tasks with energy.

Soon after the sleet-fall, in some places the ice under foot was a hazard. At times the trucks could not be used because they could not be controlled on the sheer glaze, and when men attempted to walk or to carry materials they could scarcely stand and could make no forward progress.

On some days chilly rain fell. The men were clad against it, but it was disagreeable, and as they worked they prayed that it would not freeze.

The greatest villain—after the sleet—was mud: sticky, heavy gumbo, the kind that won't come off. Even four-wheel-drive trucks with chains on all four wheels bogged down, and when a driver gave full power to wheels that the mud gripped fast, an axle was likely to snap. More than one crew, loaded with crossarms or wire or hardware, had to walk miles through mud which grew heavier with every step because no truck could negotiate the mire which halted direct access to the line.

The point is, of course, that despite many handicaps the men got to where they were needed. Once there, they pitched right in, and by virtue of long days, expert skill, and capable direction, got the job done. The circuits were quickly back on an emergency basis, while more permanent restoration followed where necessary.

Even before the wires could be put back, Bell System emergency radio telephone equipment brought stopgap service to break many towns' isolation. To supplement Southwestern Bell's three two-way sets, others were quickly obtained from the Wisconsin, Illinois, Mountain States, and Southern Bell companies, and Long Lines, and between the middle of January and early February almost 1300 toll calls were handled by these portable sets. Over one of them the average was 100 calls a day for four days.

Urgent as was the need for restoration, safety of every man was the first consideration. Falls and power lines were the big hazards, and against these the Plant Department took special precautions. Standing poles, no matter how firm they seemed, were pike-tested before men climbed them; and lines were prechecked for contact with dangerous

power lines before the men were permitted a near approach.

Coöperation between telephone men and power company men was cordial and effective. The foremen gave priority to power company dispatching circuits, so that the power companies could send emergency crews to repair dangerous line breaks, and those crews made it their first business to free telephone wires of "power crosses."

EVEN AS telephone men poured in from more than a score of states to meet the crisis, so did telephone supplies—thanks to the scope, the organization, and the emergency experience of the Western Electric Company, the manufacturing and supply unit of the Bell System.

As the extent of the damage in Southwestern Bell territory became apparent, Western Electric went into action, following the pattern which experience has proved so effective in Bell System emergencies over a period of many years. Emergency organizations, set up *before* the winter storm season commenced, were alerted. Within hours of the first damage reports, badly needed supplies were rolling into the storm areas by plane, truck, and train.

Key personnel of Western's Distributing Houses, Merchandise and Supplies Service organizations, and Traffic Division remained on the alert 24 hours a day, seven days a week, to expedite shipments of materials. The demands for supplies to restore service presented the severest test of Western Electric's emergency resources since the New England hurricane of 1938. From January 12 until storm requirements were fulfilled, shipments of copper line wire alone amounted to 2,100,000 pounds. Among other items delivered in very large quantities during this period were 9,800,000 feet of drop wire, 241,000 pounds of copper tie wire, 108,000 pounds of steel line wire, 720,000 feet of strand, 1,771,000 copper tie splints, 1,469,000 sleeves,

Texas mud greatly complicated the progress of restoration

No Wonder We Won a War

Durant, Oklahoma
February 1, 1949

The Telephone Hour
N. B. C., Radio City
New York, N. Y.

To Whom It Will Be of Most Interest:

This is the right time to tell the Bell Telephone Company some of the nice things we know about them.

Last week we were without a telephone, due to the ice-storm that enveloped this district, a continuation of one that developed in west and north Texas early in January. Unless one witnessed it, it is impossible to believe! The tops of tall trees lay on the ground, under tons of sheet-ice—the telephone and electric lines were as large around as a man's forearm and of course were eventually a mass of tangled wreckage. For sixty hours the noise of falling wires and timber was like a barrage in battle—in fact, one facetious fellow's last call before his phone went out, was to the newspaper and the single word "T-i-m-b-e-r!" Our telephone went out Tuesday—by Saturday hundreds of men from this and surrounding states—telephone crews—were working feverishly to restore service. In the block behind my home it took hours to *beat* the ice off the fallen wires, put up new poles and cross-beams.

I did not see one man (and I had a good observation post) hesitate or waste time in this work of restoration—altho the temperature stood for hours at 3 degrees to 10 degrees above zero. Those men climbed the poles and worked as if it were a pleasure—singing and joking and laughing—not a gripe!

At dark last night when I could no longer see, two men were still on top of a telephone pole just back of my house. I don't know if they "observe hours"—but *service* was certainly the *first* objective with them, I can assure you! (No wonder we won a war.)

When night came we tuned in to "The Telephone Hours" as we always do—I hoped some reference would be made to the loyalty and efforts of these men (but we are *so* small and so far away from Radio City) but I was *not* disappointed, only the half was not told: Nor could it be! Like this reference I must make to a youngster, not more than twenty years old, I'm sure, who lifted and attached our personal service wire. The pole with the saw on it was heavy, a heavy limb was across the wire and the long line was heavy and the boy *cold*—so—he lost control of the pole and it fell, striking him across the face and head, staggering him, and knocking his cap to the ground. I felt like saying a bad word for him, as *he didn't*, but without hesitation he grasped that instrument again with an air of "I'll show you who is boss," and finished his job. Then when he came in to check my 'phone, he observed that my cord was worn so he volunteered "I'm going to report your cord in bad condition and you'll get a new one soon." (Just that extra ounce of service.)

Yes, your program and music is wonderful and your organization a miracle but a miracle brought about by the loyalty and interest of men like that boy—Thank you for both.

Sincerely,

Mrs. W. C. Riddle

81,700 crossarms, and over 15,000 poles.

All told, a total of 52 different classes of items were shipped from Western Electric Distributing Houses, factories, and suppliers in 72 cities and towns in 24 states and delivered to the Southwestern Bell Telephone Company at point of need. Despite the magnitude of this emergency job, there was no sacrifice of quality in the materials supplied. Western Electric supplies inspectors saw to it that the same high standards were maintained in the emergency shipments that apply in everyday operation.

Focal points for the distribution of these large quantities of materials to the affected areas were Western Electric's St. Louis Distributing House and the Houses located at Dallas, Kansas City, and Houston. Supplies were sped from these Distributing Houses and direct from suppliers to the telephone company repair crews in the field as fast as needed. Distributing House stocks were immediately replenished from Merchandise stock at Western's Works locations and at suppliers' plants or from material specially manufactured by Western Electric and its suppliers. Shipments were also made to the Houses in the affected area from Western Electric Distributing Houses in Min-

Day and night, the supplies were loaded aboard trucks at Western Electric distribution houses for the storm area. This picture was taken at the Houston House

neapolis, Denver, New Orleans, and Atlanta.

At factory locations, normal shipments of critical items were diverted to the storm areas until emergency requirements were filled. Many items were manufactured on a highly accelerated basis. One such emergency assignment was an order for some eight miles of toll cable to replace cable destroyed by an overload of ice on the main pole route between Dallas and Oklahoma City. By giving the job the highest priority, Western Electric's Point Breeze Works made and delivered the cable in one week. A short time later, four miles of toll cable for emergency replacement near Denison, Texas, was turned out by Point Breeze in four days.

At one point, to keep pace with the demand for copper sleeves, Western Electric had the raw materials shipped by air express from Rome, N. Y., to Chicago. The shipment arrived at 7 p.m. on a Saturday and was taken to Western's Clearing and 47th Street Plants for processing. Finished sleeves were on their way to the St. Louis Distributing House by noon next day.

Many times, storm orders came through late at night. For just such situations, Western Electric maintains an emergency directory of Western Electric personnel, suppliers, and transportation companies, which gives the home telephone numbers of individuals delegated to handle emergencies. Suppliers' representatives were frequently located at their homes—one was even called out of a barber's chair while being shaved—by members of Western Electric's Supplies Service organization and requested to get material ready for shipment. Meanwhile, members of Western's Traffic Division telephoned trucking companies, airlines, railroads to arrange for the routing of the cargo to the storm areas by the fastest means possible.

Delivery of such large quantities of materials in such quick time is possible because Western Electric's long experience with the needs and problems of the Bell companies permits advance planning, because Western Electric's nation-wide facilities may be called upon at a moment's notice night or day, and because Western Electric and telephone company people are accustomed to working together in emergencies and in day-to-day operations as a closely integrated team.

CALL THEM one storm or many, they presented a challenge to the Bell System. And in both areas, north and south, the System's men and women —and, yes, organizations—have again shown their capabilities. They may properly be proud of the special service which they have rendered to many people over large sections of our country.

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